WORKING PLAN

FOR

THE TINNEVELLY-*cum*-RAMNAD FOREST DIVISION 1949-50 TO 1963-64

BY

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Under the direction of the Conservator of Forests
Working Plans Circle

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PREFACE.

This Working Plan for the Tinnevelly Forest Division revises Mr. E. A. Lasrado's Working Plan which expired in 1943-44. Sri V. S. Krishnaswami took up the revision originally in 1942 and prepared a scheme to tide over the war years. This scheme not having met with the approval of the Chief Conservator, the prescriptions of Mr. Lasrado's plan were ordered to be continued till a regular revision could be undertaken on the reconstitution of the Working Plan Circle. This was done in June 1947.

2. The Tinnevelly Working Plan Division was formed on 12th June 1947 and closed on 31st October 1948.

B. A. CARIAPPA,
Working Plan Officer.

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REVISED WORKING PLAN FOR THE TINNEVELLY-CUM-RAMNAD FOREST DIVISION.

PART I.

Summary of facts on which proposals are based.

CHAPTER I—THE TRACT DEALT WITH.

SECTION 1.—NAME, SITUATION AND OWNERSHIP.

1. *General.*—The Revised Working Plan covers all the Reserved Forests of the Tinnevelly and Ramanad Revenue districts, which will hereafter be referred to as "the division." The total area of the division is 260,370·74 acres or 406·83 square miles.

2. *Position.*—The division is situated between 8° 21′ 20″ and 9° 38′ 20″ North Latitude and 77° 12′ 42″ and 78° 5′ 21″ Longitude East of Greenwich.

SECTION 2.—CONFIGURATION OF THE GROUND.

3. *General.*—The Western Ghats which start from the northernmost point in Srivilliputhur Range march southward in an unbroken line as far as the Thambaraparani Valley; thence sweeping for 12 miles in a bold curve towards the south-east they once more resume their southward trend to the sea.

4. *Chief Peaks.*—The mountains average approximately 5,000 feet, some peaks are far more than this height, viz., Kottaimalai, Vellimalai, Kallakadai mottai, Panchanthangi, Agastyamalai, Ainthalai Pothugai and Mahandragiri, etc.

5. *Zamindari forests.*—A number of Zamindari forests dovetail with the Government forests along the Ghats. The principal among these are the Singampatti Zamin, Vairavankulam Zamin and the Sivagiri Zamin.

6. *Plain forests.*—A few of the numerous isolated hillocks have been constituted Reserved forests with the object of ensuing the supply of fuel and grazing to surrounding villages. The Vallanad Reserved Forest in Srivaikuntam taluk, the Kolundumamalai and Manpottai reserves in Ambasamudram taluk and the Valaikulam and Sappaniparambu reserves in Srivilliputhur taluk are examples of such reserves.

7. *Sand dunes.*—The Kudiraimozhi Teri Reserve in Tiruchendur taluk is a large block of about 12,000 acres consisting of extensive dunes of loose shifting red sand. The origin of these red sands is still obsecure but they are believed to have arisen as a result of heavy and continuous gales which prevail from May to September during the south-west monsoon. These red sands deposited in Teri Reserved Forest are being continually moved from place to place in the windy months. (*See* also paragraph 14 below.)

8. *River systems.*—The whole area is traversed by a net-work of rivers which serve as feeders to the large net-work of tanks which are a characteristic feature of the irrigation system of the Division. The main rivers in the Division which are also important irrigation sources are :—

1 The Thambaraparani.
2 The Nambyar.
3 The Manimuttar.
4 The Varattar.
5 Kusanguliar.
6 Varahanadhi.
7 The Ramanadhi.
8 The Jambunadhi.
9 The Gatanathi.
10 The Pachaiyar.
11 The Chittar.
12 The Hanumanadhi.
13 The Kuliratti Ar.
14 The Kottamalai Ar.
15 The Rasina Ar.
16 The Mudangiar.
17 The Athithondu Ar.
18 The Chittar (Srivilliputhur Range).
19 The Periyar.

With the exception of the Thambaraparani very little of the waters of the rivers enumerated above find their way to the sea.

9. *Papanasam Reservoir Project.*—The decision, referred to in paragraph 10 of Mr. Lasrado's working plan, was taken and two dams have been constructed across the Thambaraparani, the Upper Dam in Kariar Valley and the Lower Dam below Mundanthorai by the Hydro-Electricity Department.

Section 3.—Geology, Rock and Soil.

10. *General.*—The rocks met with during the Geological survey of the division are :—

(1) Archæon rocks.
(2) Gritty sandstones.
(3) Lateritic conglomerates and gravels.
(4) Subrecent marine beds, limestones and grits.
(5) Eluviatile and marine alluvia, Kankar deposits.
(6) Blown red sands.
(7) Soils and sub-ærial deposits.

11. *The Ghat.*—The principal underlying rock throughout the Ghat forests is a granitoid gneissic formation ; it is a pale quartzo-felspathic banded rock, containing narrow veins of black mica and intercalated with numerous small plae red or pnik garnets. Outcrops of the underlying rocks appear at almost all elevations owing to the rugged nature of the country.

12. *The plains.*—The most conspicuous outcrops of the plains are the numerous masses of granular quartz.

13. *The soils.*—The soils of the division are " the Red and the Black." The black soil or regur is restricted to the cultivated area in the plains. The red soils vary considerably in character.

14. *Aeolian formation.*—Blown sands play a very important part in the plains of this division. Heavy and continuous gales prevail from May to September during the south-west monsoon. By these fierce winds the dry surface of the broad belt of red loam is swept clean and vast clouds of red dust are carried eastward to the coast, and there meeting the fresh sea breezes are precipitated giving rise to the red sand hills or teris. These sand hills comprise the whole of Kudiraimozhi Teri Reserve. The teris have been deposited upon and around a mass of impermeable marine limestone elevated to varying heights above sea-level. These teris have been causing damage to fields, gardens and even houses by their advance from time to time.

15. *Depth of the soil.*—The depth of the soil varies from one foot to 35 feet depending on the locality.

16. *Drainage.*—The surface drainage is good throughout though the sub-soil drainage is extremely variable resulting in the occurrence of water logging during the monsoon on the plateau.

17. *Conclusion.*—The configuration of the ground, the composition and depth of soil and the degree of drainage in this Division are factors which have an undoubted effect on the quality of the locality which determines the distribution of the species and the height growth of the vegetation.

Section 4.—Climate.

18. *General.*—The climate of this Division on the plains and on the lower foot hills up to an elevation of 1,000 to 1,500 feet is generally hot and dry.

19. *Temperature.*—The average mean temperature in this district is the highest for any district in the Presidency. The hottest months are April and May. Strong westerly and south-westerly winds moderate the temperature and cool the Division especially the places opposite to gaps such as Kuttalam, Sivasailam and Tirukarangudi, etc. The hill camps of Sengalteri and Mudaliaruthu are delightful throughout the year due to the increase in elevation (3,150 feet and 4,000 feet respectively) and consequent lower temperature.

20. *Rainfall.*—The annual rainfall at various Forest recording stations from 1934 to-date is given below :—

Stations.	*Elevation in feet.*	1934.	1935.	1936.	1937.	1938.	1939.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Athithondu	500	43·10	49·82	41·92	54·00	32·30	27·00
Mudaliaruthu	4,000	75·50	65·85	54·90	45·36	16·45	16·60
Mudangiar	300	20·30	17·90	9·10	54·79	22·91	14·43
Sengalteri	714	51·45	49·54	60·45	45·25	18·95	21·38
Kuttalam	750	59·40	67·30	85·10	48·60	65·20	54·90
Thirthakarai	850	63·70	75·85	94·30	57·00	60·68	75·60
Kuduvarai	1,036	57·46	91·06	92·40	63·18	105·80	84·34
Knapp's Hut	2,156	61·84	93·24	110·26	79·56	115·05	88·13
Tarivattamparai	740	33·65	12·67	Abolished.			
Mundanthorai	655	42·58	67·60	85·36	39·00	63·98	39·42
Kattalamalai	1,000	40·94	55·53	202·44	97·31	Abolished due to Hydro Electric Project.	
St. Mary's Estate	2,500	39·27	48·73	130·58	76·17		
Kannikatty	2,550	84·72	97·00	176·64	88·81	153·20	172·84
Kalivelipil	4,040	103·45	14·50	Abolished.			
Kariar	1,000	..	134·60	150·45	50·94	77·88	60·81
Sengalteri	3,151	80·50	134·10	122·47	70·40	87·10	57·70
Nambikoil	300	..	26·92	61·30	14·20	27·15	32·00
Nazareth	150	..	11·77	12·59	22·05	14·19	15·77
Ayyanarkoil	800	..	..	..	..	..	..

Stations.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Athithondu	61·80	35·8	37·20	43·26	70·80	13·45	..
Mudaliaruthu	78·50	55·0	45·95	31·20	12·60	24·00	..
Mudangiar	36·96	93·8	15·00	42·50	..	..	..
Sengalteri	49·60	40·4	24·30	15·25	22·50	14·37	..
Kuttalam	70·80	82·0	47·20	59·60	56·00	69·60	..
Thirthakarai	52·00	88·6	48·00	88·60	54·00	24·00	..
Kuduvarai	62·84	122·31	74·98	114·00	89·85	41·95	..
Knapp's Hut	75·20	131·94	101·74	126·03	86·20	27·60	..
Tarivattamparai	Abolished.						
Mundanthorai	56·92	53·1	45·50	59·00	58·00	52·98	..
Kattalamalai	Abolished due to Hydro Electric Project.						
St. Mary's Estate							
Kannikatty	200·00	206·11	36·12	182·30	..	..	..
Kalivelipil	Abolished.						
Kariar	98·81	17·05	Abolished.				
Sengalteri	89·80	117·4	76·70	74·30	95·00	93·40	..
Nambikoil	44·65	32·52	19·90	46·85	59·60	30·70	..
Nazareth	35·15	19·8	16·89	31·13	24·29	15·5	..
Ayyanarkoil	..	19·37	26·72	59·60	46·75	36·00	..

21. *The monsoons.*—This Division has the advantage and benefits of both the south-west and north-east monsoons, the former generally beginning from June and continuing with irregular intervals up to the end of August, and the latter from October to December. The bulk of the rain is derived from the north-east monsoon whereas the south-west benefits only the interior forests adjacent to the main water-shed and also the forests opposite to the gaps. No serious floods are reported to have occurred from 1934 to-date.

22. *Health.*—The Division is comparatively healthy excepting Kannikatty and its environs Kariar, Kodamadi and Mundanthorai in Ambasamudram Range which are generally noted for Malaria. The whole of the Ghat Forests of the Division excepting those noted below which are Class II have been classed as I special tract since 6th February 1933.

Number of maps.	
3	Kuttalam Upper Slopes.
52	Kuttalam, Kadayanallur and Krishnapuram Upper Slopes—Extension II.
48	Kuttalam, Kadayanallur and Krishnapuram Upper Slopes—Extension III.
6	Kalakad teak tract No. I.
76	Addition to Reserve No. 27.

The classification is just and reasonable.

SECTION 5.—WATER-SUPPLY.

23. *General.*—The water-supply at the various camps in the Division is generally sufficient throughout the year.

SECTION 6.—DISTRIBUTION AND AREA.

24. *Distribution.*—The forests of the Division have a total extent of 406·95 square miles and are distributed over seven revenue taluks as shown below :—

Taluk.	Area of forest in Sq. Miles.
Tinnevelly district—	
Tiruchendur	20·03
Srivaikuntam	7·95
Nanguneri	87·45
Ambasamudram	139·34
Tenkasi	37·97
Sankarankoil	42·64
Ramnad district—	
Srivilliputhur	71·57
	406·95

25. *Area.*—The following statement shows the area of the reserved forests in each Range :—

	ACS.
Srivilliputhur Range	45,793·21
Kuttalam Range	51,588·08
Ambasamudram Range	83,194·96
Nanguneri Range	79,794·49
Total ..	260,370·74

SECTION 7.—BOUNDARIES.

26. *General.*—The natural and artificial boundaries of the area under this plan are as they existed when the last plan was drafted and they are given below.

27. *Natural boundaries.*—The following are the natural external boundaries :—

(1) The common water shed boundary between Tinnevelly district and Travancore State, running from Tiruvannamalai mottai in Nanguneri Range almost to Sivagiri Hill, Peak in Kuttalam Range, with breaks where the Singampatti Zamin, the Shencottah enclave, and the Vairavankulam Zamin intrude between the reserved forests.

(2) The common water shed boundary between the Ramnad district and Gandam-naickanoor and Saptur Zamins.

(3) The Tambaraparani river from its source up to Mundanthorai, which forms the common boundary between the Singampatti Zamin and the Papanasam Reserved Forest.

(4) The Rasinge Ar. which is the common boundary between the Sivagiri forests and the Vasudevanallur Reserved Forest.

(5) The Periyar which is the common boundary between the Srivilliputhur Reserved Forest and Saptur Zamin.

28. *Artificial boundaries.*—Other external boundaries are artificial. They may be subdivided into "Political" and "Other reserve boundaries." Under "Political" come all the boundaries mentioned in paragraph above as well as the following :—

(1) The southern boundary of Kalakad Reserve from Cairn No. 38 to the Travancore Frontier water shed.

(2) The western boundary of Terku Viravanallur Reserve and the northern boundary of the Kalakad Reserve up to the Travancore Frontier which form jointly the southern boundary of the Singampatti Zamin. These two reserve boundaries are imperfectly demarcated by a few rock marks which besides being difficult to find are frequently duplicated along two different lines. The description of boundary in the settlement records is not clear, and varies both from the actual boundary on the ground and from the boundary as depicted in the 1 inch scale maps. There is not much exploitable forest along this boundary but it is essential with a view to avoid future litigation to demarcate clearly, as early as possible, at least the portion of the line running from Cairn No. I (at the junction of the vandal o ai with the Reserved Forest boundary on the plains) to Panchanthangi mottai, so that the working of the fuel coupes in the Vadagarai Felling Series during the period of the working plan may not be hindered by legal difficulties.

(3) The western boundary between the Aladiyur Reserve and Singampatti Zamin, This is annually cleared and fire-traced.

(4) The portion of the common boundary between the Kuttalam Reserve and Travancore State forests running from Cairn No. 182 to the water shed.

(5) The western boundary of Vadagarai Melpadagai reserve.

(6) The common boundary between Vallakalteri State forest and Chinnakadu Reserve.

(7) The common boundary between Kadayanallur Reserved Forest and Vairavankulam Zamin.

(8) The common boundary between Vairavankulam Zamin and Krishnapuram Reserve.

(9) The common boundary between Krishnapuram Reserve and Chokkampatti Zamin.

(10) The common boundary between the Srivilliputtur Reserve and the Sattur Zamindari.

SECTION 8.—LEGAL POSITION, RIGHTS AND CONCESSIONS.

29. *Ownerships.*—All the reserved forests are the absolute property of Government. The admitted rights are shown in the respective section 16 notification for each reserve which have been recorded in the District Forest Office. An up-to-date list of the Reserved forests in the division is furnished below.

The statement gives the numbers and dates of the respective section 16 notification of all the reserves in Tinnevelly Division arranged by ranges :—

Serial number. (1)	*Name of reserve.* (2)	*Area in acres.* (3)	*Number and name of section 16 notification.* *Number.* (4)	*Date.* (5)	*Remarks.* (6)
	RAMANATHAPURAM DISTRICT. *Srivilliputtur Range.*				
1	Srivilliputtur Ghat Forest Upper Slopes.	14,796·80	11	20th December 1883 ..	Srivilliputhur Reserve Forest.
2	Unnipattimalai	550·40	230	30th July 1889 ..	Do.
3	Srivilliputtur Ghat Forest Lower Slopes.	28,133·31	175	10th April 1891 ..	Do.
4	Khansapuram	535·83	383	22nd August 1899 ..	Do.
5	S. Nos. 1869 to 1871 of Valaikulam.	7·51	234	8th May 1908	Do.
6	S. No. 1725 of Valaikulam	0·23	195	4th May 1909	Do.
7	Additions 5 to 7 to Lower Slopes (Pillayarnatham Extension V).	12·74	108	22nd February 1912 ..	Do.
8	Additions 1 to 4 Sundarapandiam.	34·54	265	4th June 1912	Do.
9	Addition to Pudupatti	49·16	267	Do.	Do.
10	Extension to Venkateswarapuram.	34·54	303	17th June 1912	Do.
11	Addition in Valaikulam S. No. 1861-B and Kollangondan S. No. 2359.	27·45	25	23rd December 1912 ..	Do.
12	Additions 1 to 4 Lakshmipuram ..	35·60	151	19th March 1913 ..	Do.
13	Additions 1 to 10 Valaikulam ..	5·53	492	9th October 1913 ..	Do.
14	Additions to Alagapuri	0·34	507	31st October 1913 ..	Do.
15	Addition to Khansapuram ..	5·69	74	27th January 1914 ..	Do.
16	S. No. 1570 Valaikulam	1·76	490	9th November 1917 ..	Do.
17	Sappani Parambu Block 18 ..	375·90	311	24th October 1889 ..	Valaikulam Parambu Reserve Forest.
18	Valaikulam Parambu Block 20 ..	1,145·60	335	23rd July 1891	Do.
19	Sappani Parambu Extension ..	5·97	135	2nd March 1911 ..	Do.
20	Valaikulam Parambu Extension ..	34·33	266	4th June 1912	Do.
	Total ..	45,793·21			
	TIRUNELVELI DISTRICT. *Kuttalam Range.*				
1	Kuttalam Reserve Forest Upper Slopes.	7,344·26	11	20th December 1883 ..	Kuttalam Reserve Forest.
2	Extension I Kuttalam No. 3 and Lower Slopes.	1,698·00	178 and 179	10th April 1891 and 16th March 1901.	Do.
3	Extension III to Kuttalam Reserve Forest No. 3 Lower Slopes.	145·50	231	5th May 1900	Do.
4	Extension II to Kuttalam Reserve Forest No. 3 Lower Slopes.	133·00	205	21st May 1902	Do.
5	Vasudeva Estate	162·00	165	22nd March 1910 ..	Do.
6	Panchanthangi Estate	72·80	532	15th November 1911 ..	Do.
7	Old S. No. 1357 East of Ilanji ..	31·51	49	17th January 1913 ..	Do.
8	Addition to Kuttalam Reserve Forest Trikutachalaparvatham Kylodai.	26·66	470	6th October 1915 ..	Do.
9	Hope Estate	183·50	17	9th January 1920 ..	Do.
10	Extension IV to Kuttalam Reserve Forest.	6·31	185	22nd May 1933	Do.
11	Vadagarai Melpidagai No. III-B ..	435·20	178	10th April 1891.	..
12	Vadagarai Melpidagai North A, South A and C.	70·96	438	27th September 1912.	..
13	Kadayanallur Reserve Forest Upper Slopes.	5,036·80	11	20th December 1883.	..

TIRUNELVELI DISTRICT—*cont.*

Kuttalam Range—cont.

Serial number.	*Name of reserve.*	*Area in acres.*	*Number and date of section 61 notification.*		*Remarks.*
			Number.	*Date*	
(1)	(2)	(3)	(4)	(5)	(6)
14	Chinnakadu Reserve Forest ..	1,388·80	248	9th June 1890.	..
15	Kadayanallur Upper Slopes III-C-2 Lower Slopes.	1,171·20	178	10th April 1891.	..
16	Vadagarai Kilpidagai III C-1 ..	582·40	178	Do.	..
17	Alkondal, Nelliyuthu and Shermalai.	163·04	281	7th June 1898.	..
18	Addition to Chinnakadu Reserve Forest.	0·90	28	15th December 1911.	..
19	Kadayanallur additions, 9 small bits.	33·12	53	18th January 1912.	..
20	Krishnapuram Upper Slopes ..	3,654·40	11	20th December 1883.	..
21	Krishnapuram Upper Slopes Extension.	1,946·50	178 and 156	10th April 1891 and 14th March 1901.	..
22	Krishnapuram Upper Slopes Addition.	12·42	473	29th October 1912.	..
23	Puliyangudi, Chintamanivasudevanallur Upper Slopes.	16,038·40	11	20th December 1883.	..
24	Puliyangudi, Chintamani, Vasudevanallur Lower S[illegible]pes.	10,496·00	176	10th April 1891.	..
25	Chintamani Blocks A and B ..	321·46	231	19th May 1899.	..
26	Naranapuram Reserve Forest ..	390·31	193	29th March 1911.	..
27	Addition to Vasudevanallur ..	18·29	414	19th September 1912.	..
28	Addition to Melapuliyangudi ..	8·83	411	Do.	..
29	Addition to Tirumalapuram ..	2·23	437	22nd October 1912.	..
30	Addition to Nela Chintamani ..	6·21	439	Do.	..
31	Addition to Naranapuram	7·07	440	Do.	..
	Total ..	51,588·08			

Ambasamudram Range.

1	Papanasam Ghat Forest Upper Slopes.	63,838·85	11	20th December 1883 ..	Papanasam Reserve Forest.
2	Papanasam Ghat Forest Lower Slopes.	19,155·58	534	27th November 1890 ..	Do.
3	Hills enclosures of Upper and Lower Slopes.	189·44	19	20th December 1911 ..	Do.
4	Kaloli Enclosure	8·78	81	31st January 1912 ..	Do.
5	Addition to Papanasam Reserve Forest Lower Slopes, Vickranasingapuram village.	2·21	581	28th November 1913 ..	Do.
	Total ..	83,194·96			

Nanguneri Range.

1	Kalakad Tirukurangudi Ghat Forest Upper Slopes.	33,507·06	11	20th December 1883.	..
2	Kalakad Teak tracts I—III ..	271·20	165	10th June 1889.	..
3	Kalakad Tirukurangudi Ghat Forest Lower Slopes.	21,083·20	533	27th November 1890.	..
4	Vanamutty	1·99	194	25th April 1898.	..
5	Mahendragiri	33·78	249	18th May 1898.	..
6	Nadugani I bit	3·84	487	12th December 1903.	..
7	Nadugani II bit	6·46	244	14th June 1905.	..
8	Kulisalkidai	0·99	244	Do.	..
9	Jadikaitottam	2·55	244	Do.	..
10	Ladanthottam	10·22	137	27th March 1906.	..
11	Taraganay Estate	110·00	243	10th May 1907.	..
12	Mayampurambu Estate	109·20	497	5th September 1910.	..
13	Addition to map No. 20, Nos. 483 and 484, Malayadipudur.	6·50	147	11th March 1912.	..
14	Addition to Map No. I, Nadugani last bit, S. No. 982 of Tirukurangudi village.	1·32	349	14th July 1913.	..
15	Addition to Map I, Mahendragiri, S. No. 984-2.	9·88	163	12th July 1921.	..
16	Addition to Map I, Karumandiamman S. No. Shola 803/1 and 3.	90·74	110	21st April 1923.	..
17	Kolundumamalai Reserve Forest ..	1,539·17	88	17th February 1890.	..
18	Therkuviravanallur Reserve Forest.	3,187·20	534	27th November 1890.	..
19	Vallanad Hill Blocks A and B ..	4,647·20	465	14th October 1891.	..
20	Land adjoining Vallanad Hills Block A-I to III.	428·28	390	3rd August 1896.	..
21	Vallanad additions	11·90	16	24th December 1910.	..
22	Kudiraimozhi Teri Reserve Forests.	11,299·96	309	21st June 1892.	..
23	Addition to Kudiraimozhi Teri Reserve Forest Blocks A and B, Nazareth village and C Block in Eluvermukki, Semmarikulam and Kudiraimozhi village.	1,472·24	141	17th February 1937.	..
24	Manpothai Reserve Forest	1,242·00	511	8th November 1898.	..
25	Valliyur Reserve Forest	605·11	51	28th January 1904.	..
26	Extension to Valliyur Reserve Forest.	112·50	478	6th November 1908.	..
	Total ..	79,794·49			

The numbers and dates of section 16 notification pertaining to the reserves in the division handed over to panchayat or to the Public Works Department for management are set out below :—

Public Works Department—Tuticorin Port Trust.

1	Kalivayur Reserve Forest ..	158·07	197	6th July 1889.
2	Mullakadu Reserve Forest ..	949·26	297	3rd November 1923.
3	Hare Island Reserve Forest ..	146·12		
4	Pannaiyadi Island Reserve Forest.	105·59		

Panchayat.

Serial number.	*Name of reserve.*	*Area in acres.*	*Number and date of section 16 notification.* *Number.*	*Date.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)
1	Gangaikondan Reserve Forest ..	1,391·00	363	2nd August 1898 ..	Gangaikondan Reserve Forest.
2	Sivalaperi Reserve Forest	215·24	149	10th April 1891 ..	Sivalapperi Reserve Forest.
3	Melapattam Reserve Forest ..	913·16	588	3rd December 1897 ..	Melapattam Reserve Forest.
4	Wolf Hill Reserve Forest	848·13	474	11th September 1896 ..	Wolf's Hill Reserve Forest.
5	Talaiyuthu Block A and B Reserve Forest.	1,445·79	150 and 368	10th April 1891 and 24th July 1896.	Thalaiyuthu Reserve Forest.
6	Kottamalai Reserve Forest ..	883·20	304	24th October 1889.	..
7	Kavalkattiparambu Reserve Forest.	371·20	303	Do. ..	Kottamalai Reserve Forest.
8	Kottamalai Additions	19·27	18	21st December 1911.	..
9	Kottamalai Extension	137·61	529	21st November 1912.	..
10	Kottankulam Block 17	550·40	214	27th May 1890	Kottankulam Reserve Forest.
	Total ..	8,134·04			

30. *Tree pattas.*—A peculiar survival is the existence of tree pattas issued in pre-settlement days to pattadars for the usufructs of palmyras and fruit-bearing trees grow in the reserved forests. Patta palmyras exist in the Kudiraimozhi Teri Reserved Forest and Kalakad Reserved Forests of Nanguneri Range. The question of extinguishing the rights will be discussed elsewhere.

CHAPTER II—DESCRIPTION OF FOREST.

SECTION 1.—COMPOSITION AND CONDITION OF CROP.

31. *General.*—Elevation, rainfall, the nature of the soil, and proximity to cultivation and therefore to injury by man, are the principal factors which control the types of forest growth in the division. For convenience of description the main types enumerated below may be distinguished. The line of distinction between two types is by no means clear, one type tending to merge almost imperceptibly into another. (The area data given under each type should therefore be considered only as a rough approximation, as both the value of the standing growth and the precipitous nature of most of the country, did not justify expenditure on very detailed stock-mapping into types.)

32. *Type I* consists of an extremely zerophytic type of vegetation, the principal species being *Dalbergia multiflora, Acacia planifrons, Acacia latronum, Zizyphus xylopyra, Albizzia amara* and *leucophloea, Balsamodendron berrvi* ; and *Dichroatachys cinerea* ; the undergrowth consists mainly of *Dodonea viscosa, Pavetta indica, Cassia auriculata, Pleotronia parviflora* and *Euhorbia tirucalli* with strobilanthes in the moisture parts. Examples of the forests of this types are the plain forests of Vallanad in Srivaikuntam taluk, the Valaikulam and Sappaniparambu Reserves in Srivilliputtur taluk, and the Kolundumamalai and Manpothai Reserves in Ambasamudram taluk. Being closest to cultivation, this class of forest suffers most from overgrazing and injuries by man. The surface soil being hard and of low permeability, what little rainfall there is runs off the surface of the hilly ground rapidly with the result that although coppice regeneration is fair, natural seedling regeneration is conspicuous by its absence. The result is that stocking is variable being very

poor in parts. Some form of artificial regeneration, whereby the rapid descent of rain water may be arrested, and the moisture made available for the seedlings raised, is clearly called for, in order to enable the complete stocking of these forests. Money spent on such measures would, we consider, be amply recouped from the increased yield in view of the proximity of such reserves to consuming centres and their consequent accessibility.

Area : 11,570 acres.

33. *Type II* is a less zerophytic type which extends for the most part over the outermost slopes of the ghats, from the margin of cultivation to an elevation of 300–500 feet. Here the principal species are teak *Albizzia amara, Zizyphus* sp., *Givotia retteriformis, Cochlospermum goseypum, Pyotium caudatum Acacia leucophloca, Dolichandrone crispa, Morinda tinctoria, Butea frondoss,* etc.. under growth consisting mainly of *Dodonea viscosa Ixora parviflora, Pletronia parviflora, Garissa carandas, Cassia auriculata* and *Maba buxifolia.* This type is probably only a progressive succession on Type I and a regressive succession of Type III described below caused principally by destructive fires and excessive grazing in the past.

Area : 38,080 acres. 381

34. *Type III* may be described as an associate formation of deciduous species degraded in parts by recurrent fires. It comprises all the forests on the outer slopes above Type II up to an elevation of about 1,700 feet. In favourable localities where the soil is richer, e.g., the Ayyanarkoil series—or the rainfall greater, e.g., the Kuttalam series west of the Chittar—this type comes down to the margin of cultivation. The principal species associated with this class of forest are teak, *Pterocarpus marsupium, Dalbergia sissoides, Albizzia lebbek, Albizzia odorotissima, Grewia* sp. *Chloroxylon swietenia,Terminalia, belerica,Scheichera trijuga, Stereospermum chelonoides, Pongania glabra* along streams *Anogessus latifolia, Sapindus emarginatus, Melia dubia, Melia azadirachta, Careya arborea, Dalbergia paniculata, Eugenia jambolana, Bridelia retusa, Hardwickia binata,* etc. The undergrowth consists principally of *strobilanthes;* grasses, *Helicteres isora, Pavetta indica, Mundulea suberosa, Murraya exotica, Clycosmis pentaphylla,* etc. Creepers are of very frequent occurrence, the principal being *Acacia intsia, Pterolobium indicum* and *Atylosis* sp. Where fires are rare and the rainfall over 50 inches the growth is dense, and the species in admixture good. The locally famous slow-grown teak of the division is found in this type of forest, the best growth being found between 500 feet and 1,000 feet elevation. The only sandal in the division, in the Alagarkoil valley of Srivilliputtur Range and to a smaller extent in the Kuttalam fuel series, occurs in this type of forest. Practically all the fuel series are to be found in these two types of forest. Whereas coppice regeneration is generally good, seedling regeneration leaves much room for improvement. There is a distinct need for artificial regeneration not only to accentuate the density of stocking where necessary but also to increase the number of the more desirable and valuable species, such as teak, *Dalbergia latifolia,* and *sisoides* and *Pterocarpus marsupium* where these species can be grown satisfactorily. This forest type is eminently suited for the production of small timber if worked under "simple copice" on a rotation of 35–40 years. Rigid fire protection and closure to grazing for at least the first decade of the rotation are the two essentials.

Area : 31,740 acres.

35. *Type IV* where fires are recurrent especially on steep slopes, a Savannah formation appears. Where the canopy is very open, high grass (*Andropogon blaii* principally) overruns the area and only fire-resistant species like *Anogessus latifolia, Terminalia chebula, Pterocarpus marsupium, Buchanania latifolia, Careya arborea, Phyllanthus emblica* remain scattered over the grass in a damaged condition. The area below the Sengalteri rest house is a characteristic example. This class of forest is not suitable for exploitation at present but with adequate fire protection would probably revert to Type III in process of time. It comprises many of the so-called "Hill grazing" compartments of the division and will be regarded as having for the present only a protective function.

Area : 53,040 acres.

36. *Type V* where the rainfall is over 75 inches and elevation over 1,000 feet and the soil suitable the deciduous forest gives way to a semi-evergreen type the principal species met with being *Balanocarpus utilis, Hopea parviflora, Pterospermum rubiginosum* and *glabrescens, Agalia courtallensis* and *barberii, Nephelium longanum, Hemicyclia venusta, Hardwickia pinnata, Stereospermum chlenoides, Dalbergia latifolia, Chukrassia tabularis, Artocarpus integrifolia, Bischofia, javanica, Carallia integerrima, Diospyros* sp., together with a host of other less-known species. The undergrowth here consists of *strobilanthes, Clycosmis pentaphylla, Helecteres isora,* canes, etc. Small patches of this type of forest are found along streams at elevations below a 1,000 feet, but the greater portion occurs between 1,000 and 2,000 feet elevation. Where the soil, as reflected in the height growth, is good, this type of forest is ideally suited for conversion into teak plantations. The majority of

this type shows a marked uniformity as far as the density of stocking is concerned, which is quite good. This is probably accounted for by the increased rainfall and consequent increased vegetative activity. The quality of locality however varies greatly with the depth of soil, and as a few years are neceassary for the factors of locality to manifest themselves in the young crop, an unwise selection of an area for teak planting is apt to become apparent only after 4 to 5 years, when it is too late to remedy the defect. Parts of the Kodamady and Kariar Teak Plantations exemplify this. The height growth of the existing forest is the only safe criterion, to go by in selecting areas suitable for teak planting.

Area : 14,700 acres.

37. *Type VI* is the evergreen rain forest or shola forest. This is the most highly developed ecological type of vegetation in the division. The great mass of this class of forest commences at an elevation of about 2,000 feet and extents upwards to nearly the crest of the mountains up to 4,500 feet, the growth deteriorating rapidly along the windswept ridges, both in quality and volume per acre. The whole of the hills above 2,000 feet are not however clothed with shola forest. There is much bare and precipitous rock and extensive areas where the rock is near the surface, are covered with high grass, *Phoenix sylvestris*, and stunted tree growth. Small patches of isolated shola, cap most of the sheltered faces of the peaks and thus enhance their scenic value, much of the true shola forest has been destroyed by extensive clearings made by hill tribes—the Kanis and coffee planters in the past. The secondary shola growth, consisting chiefly of *Macaranga*, *Mangifera*, *Clerodendron*, *Dyospyros sp. Eugenia sp.*, *Myristica sp.*, etc., which is met with in abandoned coffee estates and old Kani clearings, are a feature of the tract, characteristic examples of the former being the old Kuliratty and Taraganar estates in the Nanguneri Hills, and of the latter the Sembatota on the left bank of the Kariar.

Area : 44,100 acres.

With decreasing rainfall the minimum elevation at which the true shola appears, increases. Thus in Nanguneri Range where the rainfall is less than in the Ambasamudram Range, the shola forest starts at about 3,000 feet elevation and is at its best at 3,500 feet to 4,000 feet deteriorating higher up. Similarly in the Srivilliputtur Range where the rainfall is even below that obtaining in the Nanguneri sholas, the true shola appears only at about 3,500 feet and rapidly deteriorates above 4,000 feet.

The characteristic shola type of forest occurs principally in Ambasamudram Range, where it forms a three storeyed high forest. In the topmost canopy occur principally *Mesua ferrea*, *Cullenia excelsa*, *Gluta travancorica*, *Pallaquium ellipticum*, *Hopea parviflora*, *Heritiera papilioa*, *Dysoxylum malabaricum* and *beddomei*, *Myristica beddmei*, *Eugenia sp.*, *Elaeodendron glaucum Eleocarpus tuberculatus*, *Canarium Strictum* and *Vateria indica*. In the second storey, besides pole growth of the species enumerated above occur *Aglaia sp.*, *Myristica malabarica*, *Artocarpus integrifolia*, *Anacolosa densiflora*, *Gordonia obtusa*, *Nephelium longanum*, *Poeciloneuron parciflorum*, *Lansium sp.*, *Pygeum wightianum*, *Filicium decipiens*, *Garcinia sp.*, etc. In the lowest tier, besides sapling growth of the species mentioned above, is found *Agrostistachys longifolia*, *Mallotus sp. Cinnamomum gracile*, *Aporosa acuminate*, *Hudnocarpus alpina* and the bright crimson fruited *Baccaurea courtallensis*. The undergrowth consists principally of rattan, wild cardamoms, *Pandanus sp.*, *Solanum sp.*, and the dreaded, but comparatively rare devils nettle, Laportea crenulata. Picturesque and palms, *Pinanga dicksonii* and Caryota urens are also scattered all over the forest.

Area : 24,600 acres.

The Nanguneri sholas are characterised by the total absence of *Gluta travancorica*, the comparative rareness of *Mesua ferrea* and the great preponderance of *Pallaquium ellipticum* and *Mangifera* indica. The dominant association in the Sengalteri shola is the Pallaquium-Mangifera type. Around Netterikkal a few big sized *Podocarpus latifolia* occur, but beyond the botanical interest centred in the fact that it is the only indigenous conifer in South India, the tree is not of importance as it is not present in exploitable quantities. The Nadugani and Mahendragiri sholas are also of poor quality, the principal saleable species being *Bischofia javanica* and *Heritiera papilio* of comparatively small dimensions.

Area : 9,100 acres.

The Kuttalam sholas are all very deficient in exploitable species, and are generally poor, all the best shola areas having been acquired by coffee planters in the past and partially destroyed.

Area : 6,700 acres.

The Srivilliputhur Range contains a number of patches of shola varying in size from 100 acres to 350 acre s,which are surrounded by grass land. The sholas are not either so

dense or so luxuriant as in the Ambasamudram Range and, owing to the fact that the Travancore high ranges and the Upper Palnis keep off much of the rain which would otherwise fall on these hills, the locality is far less moist. The principal species are *Acrocarpus fraxinfolius, Cedrela toona, Mesua ferrea, Eugenia sp., Pallaquium ellipticum, Bischofia javanica* and *Mangifera indica.* The maintenance of the essential characcter of these rain forests, whether exploitable or not, and the undertaking of inexpensive measure for their extension are matters of the first importance, in view of the great part they undoubtedly play in conserving and regulating the water-supply of the rich and extensive irrigated lands in the plains, some of which, in the Tambaraparni Valley, bear a double crop assessment of Rs. 22–8–0 per acre per annum, a rate unknown elsewhere in the Presidency.

Area : 1,350 acres.

38. *Type VII* embraces the areas covered by the eta reed. Near the summit of the hills above the belt of shola forests, and along the higher slopes of the various mountain ranges 3,000 feet and above, extensive areas are covered with eta reed, *Ochlandra* brandici and *Ochlandra travancoria,* an erect reed like gregarious bamboo "forming impenetrable thickets of 10 feet to 15 feet high from which stand out scattered trees of *Vernonia monosis* and *Eugenia sp.*" (Brandis). This reed not only occurs in vast areas to the exclusion of all other vegetation, but also encroaches into sholas wherever the fall of a big tree on the borders of a shola lets in sufficient light to permit of its growth. Streams also play a great part in dissemination of the seed of the reed, many of the streams originating in reed areas, and flowing through sholas containing a dense growth of reeds on their banks wherever light conditions are suitable. A picturesque feature of the reed areas, is the gregarious growth of the palm *Bentinckia coddapana,* which usually cultivates the steepest portions of rocky peaks and knolls above 4,000 feet elevation, and contributes much towards alleviating the monotony of the vast sea of eta. That the reed encroaches on the shola and not *vice versa* is, we consider, borne out by the frequently observed fact that large trees of *Pallaquium ellipticum, Mesua ferrea, etc.,* are frequently noticed growing *isolated* in a sea of reed jungle. This class of forest has not been exploited in the past to any appreciable extent but has great economic possibilities which are commented on in paragraph 72 below. One rather remarkable feature is that whereas the eta reed occurs wide spread in Kuttalam, Ambasamudram, and Nanguneri ranges, it is conspicuous by its absence at similar elevations in Srivilliputhur Range. The lower rainfall may account for this.

Area : 35,100 acres.

39. *Height growth.*—The height growth is a function chiefly of three variants the species, the factors of locality, and the rainfall. In type I forest which is mainly scrub jungle the height growth at maturity rarely attains 12 to 15 feet, the average being in the vicinity of 10 feet. Type II varies from 12 to 25 feet and type III which comprisies the best deciduous forest, from 25 to 50 feet. In type IV the height growth on account of adverse factors like fires, and the diminishing fertility of the soil, recedes to 20 to 25 feet, the average being well below 20 feet. The semi-evergreen type maintains a height of 35 to 60 feet, merging almost imperceptibly into the evergreen shola forest. The height growth of the latter varies with the rainfall and the depth of soil which tend to increase it, and the elevation which tends to depress it. Thus on the wind swept ridges above 4,000 feet the forest is barely 30 to 40 feet high, while in the undulating valleys at 2,500 to 3,000 feet elevation of which the forest at Kannikatty is typical, the forest has an average height of 120 feet.

40. *Density of stocking.*—In most of the fuel felling series this is probably between 0·7 and 0·8 on an average, though it is so variable that in the same coupe a fully stocked area and an area where the stocking is below 0·5 is often met with. Type IV forests however are the most sparcely stocked, the density of stocking being well below 0·2 as a rule. The semi-evergreen forests are fully stocked, the blanks met with being obviously areas where either nature has given up the attempt at afforestation as an impossibility, or areas which have been destroyed by man in the past and are under process of being reclaimed to forest growth.

41. *Teak plantations.*—Mention must be made of the existence of about 475 acres of teak planations, formed in the past by enthusiastic District Forest Officers. This point will be dealt with more fully in Chapter V. The oldest plantation made in 1907 has already more than paid for itself from thinnings ; given the necessary soil conditions, such conversion is a most profitable forest investment. Another encouraging factor is that the

existing growth is saleable and fetches as much as Rs. 20 to Rs. 50 per acre, prior to the period of Mr. Lasrado's Working Plan while in recent years on account of war it has risen upto even Rs. 500 per acre.

In the choice of areas for teak planting the nature of the soil is an important factor. A simple rule is not to choose areas where there is too much red in the soil. The highly ferruginous nature of such soils has been found by experience in this division, to have a definitely deleterious effect on the subsequent growth of the teak. Pale red soil, river alluvium, and the light brown soils, found in semi-evergreen areas have been found to be most suitable. This rule also applies to the introduction of teak in regeneration operations in the fuel series.

42. *Seed years.*—Most of the deciduous fuel species seed fairly abundantly annually. It is a matter of local experience that a year of bad rainfall is *followed* by a particularly good seed year. The evergreen species however are somewhat capricious in this respect and good seed years occur at intervals varying from two to four years. Such information as is considered reliable regarding the time of flowering, seeding, etc., of our more important fuel and timber species has been collected and is detalied in Appendix II. It has been found that Range Officers' annual report on this important subject have tended to be more or less faithful copies of their predecessors' reports, and are therefore liable for the suspicion of inaccuracy.

SECTION 2.—INJURIES TO WHICH THE CROP IS SUBJECT.

43. *Climate.*—The chief climatic factor to be feared from the standpoint of regeneration is the failure, partial or total, of the monsoons. Untimely rainfall also affects regeneration operations. The south-west monsoon breaks usually early in June, but heavy and continuous rainfall is not unknown in May. Time is the essence of all regeneration operations, and expenditure on replacing casualties, can only be kept within reasonable bounds, if such operations are conducted so as to take immediate advantage of such rain that occurs. It is therefore important that all is ready for teak planting by the end of April at the latest. The frequent and sometimes prolonged breaks in this monsoon point to the advisability of "stump planting" of teak rather than dibbling or transplanting, as the reserves of food material stored in the "stump", and the depth of planting which enables it more quickly to tap the lower soil moisture, will aid the plant in tiding over rainless periods of short duration. In addition to these factors the size of the stump will enable it to withstand displacement by floods to a greater extent, a matter of great importance in localities where a rainfall of over 16 inches in 24 hours is not unknown; such was experience during the north-east monsoon of 1931 at St. Mary's, Kattalaimalai Estate. The so-called *Kodai* rains of April, which are of immense help in assisting the agriculturist to get a "golden" tilth for ploughing, frequently obstruct burning operations, and the necessity for completing burning in all regeneration areas by the end of March is indicated. The north-east monsoon is also capricious appearing at any time from the middle of October to the first week of December. Its late appearance usually heralds a season of floods. All preparations for regeneration operatoins in the fuel series which come under the influence of this monsoon only, are best completed by the end of September.

44. *Winds.*—The hot dry gales which sweep the eastern face of the ghats from June to September generally from the West (although owing to the formation of the mountain masses the wind direction is apt to vary from south-west to north-west) do some damage especially to standards in the "coppice with standards" coupes, and to young regeneration areas, where the teak plants are frequently broken, blown down or deprived of their leaves. The necessaity for carrying out fellings, as far as possible against the wind direction is indicated. The impetus these winds give to forest fires is however a greater menace to the forest.

45. *Fire.*—The maxim that "fire is a good servant but a bad master" is seldom impressed on humanity with greater force than it is on the forest officer. The fire season in the division extends for seven months from April to October, fires being especially frequent and disastrous in those portions of the division which do not come under the beneficient influence of the south-west monsoon. The maximum intensity is attained in such areas from May to September.

46. *Incidence of fires.*—The following table abstracted from the fire reports of the division shows the number of fires that occurred in the division during the decennium ending 31st March 1946 :—

Fire Statement.

Serial number and Year.		*Srivilliputhur Range.* Number of fire.	Protected.	Unprotected.	Total.	*Kuttalam Range.* Number of fire.	Protected.	Unprotected.	Total.
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	1937	15	..	1,080·00	1,030·00	46	499·50	7,253·00	7,752·50
2	1 38	23	..	2,737·75	2,737·75	29	624·00	2,402·00	3,026·00
3	1939	20	584·00	1,102·00	1,686·00	27	818·00	1,790·00	2,608·00
4	1910	14	490·00	342·00	832·00	28	458·00	732·00	1,190·00
5	1941	18	1,007·00	370·00	1,377·00	29	605·00	683·00	1,288·00
6	1942	15	1,983·00	21·00	2,004·00	38	457·00	1,538·00	1,995·00
7	1943	14	961·00	732·00	1,693·00	20	239·00	735·00	974·50
8	1944	15	2,405·00	730·00	3,135·00	15	442·00	422·50	864·00
9	1945	22	1,303·00	399·00	1,702·00	30	230·00	1,621·55	1,851·55
10	1946	17	100·00	915·00	1,015·00	31	398·00	3,348·00	3,746·00

Serial number and Year.		*Ambasamudram Range.* Number of fire.	Protected.	Unprotected.	Total.	*Nanguneri Range.* Number of fire.	Protected.	Unprotected.	Total.
		(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1	1937	28	..	15,008·00	15,008·00	46	20·00	2,628·50	2,648·50
2	1938	27	..	1,643·00	1,643·00	31	634·00	5,975·00	6,609·00
3	1939	18	1,030·00	1,932·00	2,962·00	36	62·00	3,601·00	3,663·00
4	1940	15	75·50	370·50	446·00	27	258·00	1,683 5)	1,942·00
5	1941	21	119·00	1,085·00	1,204·00	28	1,192·00	3,494·00	4,686·00
6	1942	10	50·00	836·00	886·00	46	3,376·00	1,790·00	5,166·00
7	1943	11	67·00	1,140·00	1,207·00	48	462·00	2,692·75	3,154·75
8	1944	39	2,161·00	912·00	3,073·00	55	287·00	3,205·00	3,492·00
9	1945	44	3,984·50	442·18	4,426·68	47	205·00	1,652·66	1,857·56
10	1946	32	1,461·25	67·00	1,528·25	30	200·00	1,309·00	1,509·00

47. *Causes of fires.*—Fires in the division are principally caused by graziers in search of tender grass for their cattle. This nefarious pastime of the ryot is more commonly practised in the various Zamin and Mittah forests of the division, where discipline, is lax and retribution slow or absent, and where on account of the constant fires much of the original forest has been converted into poor grass land. The Chokkampatti and Vairavankulam mittahs in Kuttalam Range are characteristic examples, and a comparsion of their present state with the state of the adjacent Government forests will convince even the most sceptical lay man of the advantages of forest conservation, so striking is the difference. The need for safeguarding the forests of the division by fire tracing the common boundaries between the reserves and Zamin forests is very pressing in view of the fact, borne out amply by fire maps of recent years, that the majority of fires have crossed over the common boundary from Zamin forests. The Zamindars are, or pretend to be, quite alive to the danger of fires and most of them expressed their willingness to contribute labour or money towards clearing and fire tracing their common boundary. Advantage should be taken of this to put the matter, by agreement, on a permanent basis. The solution of the fire protection problem as far as the reserves are concerned, lies in the *immediate* closure to grazing, of all areas burnt, on silvicultural grounds, to enable them to recover. Experience has shown that this is of value provided a consistent policy is followed. Closure, however must be effective, otherwise grazing fees merely find their way to the pockets of the subordinate staff instead of into the treasury. Frequent inspections of closed areas by the District Forest Officer and remorseless treatment of delinquent subordinates is what is needed. The necessity for putting out fires as soon as they are detected does not appear to have been sufficiently impressed on the subordinate staff, many of whom are not even aware of the provisions of Section 23 of the Madras Forest Act, whereby the nearest villagers, contractors, labourers, etc., can be impressed by forest subordinates, on pain of penalties, to help in extinguishing fires. The present system under which forest subordinates are allowed on occasion to pay coolies for help in extinguishing fires cannot be sufficiently condemned. It is open to the serious abuse, that ryots in the off agricultural season may frequently set fire to the forests themselves, in the expectation that they may be paid by the department to extinguish such fires. A few judicious prosecutions would certainly bring round recalcitrant villagers to a sense of their responsibilities relating to fire fighting.

Apart from this source fires are also caused by the minor forest produce contractors' coolies, while searching for honey gallnuts, etc., and a few fires escape from the charcoal pits of fuel contractors, mainly through carelessness. The ancient muzzle loading guns of illicit poachers, packed as the barrels are with gunpowder and paper wads, also cause fires, especially as this class of ryot frequently haunts the forest during the nights of the fire season, when the weather is likely to be less inclement and scarcity of water concentrates game at well known water holes.

48. *Fire damage.*—The chief injuries to the forest from fire are the invasion of coarse grass to the exclusion of more desirable grasses and undergrowth, the killing back of valuable regeneiation as well as of older trees, the scarring of trees, the scorching of foliage and consequent loss of increment, and the impoverishment of the soil through the removal of desirable humus and its sources ; and last but by no means least, the probable reduction of the value of the forest as a catchment area. The history of fire protection in the division so far as it is known is given below. Although crown fires have not been reported many of the older trees, especially in Type IV forests exhibit fire scars to a height of 20 feet. This may be due to the fact that where the canopy is very open, high grass invades the area, and ground fires in such localities are uncommonly fierce. In areas where there is a young crop, e.g., regeneration areas and coupes below five years of age, fires do very serious harm, and the special protection of such areas is indicated.

49. *Injurious plants.*—Grass is indirectly injurious on account of the enhanced fire risk, and is also directly harmful in removing nutrition and moisture from the surface soil to an excessive extent, thus preventing direct access of tree seeds to the forest floor. It also provides a poor quality of humus, and excludes the more desirable species of undergrowth which would enrich the soil and give useful material burning in regeneration operations. It has also a definite suppressing effect on regeneration of tree species, *Pterocarpus marsupium* especially persisting for years in a suppressed condition under its shade.

Lantana is also a pest as it makes progress through the forest difficult and also has a tendency to assume a scandent habit and swamp plantations and newly cleared areas. With the exception of portions of the Kuttalam Fuel Series in Kuttalam Range, the Ullar and Sivasailam valleys in Ambasamudram and Mungilpatti Kidai valley in Nangunery Range, it does not seem to be a menace in the division. If uprooted wherever seen by the subordinates its rapid spread is not likely to be a cause for anxiety.

Creepers and climbers are especially destructive in young coupes and regeneration areas, as they smother young regeneration for years thus materially reducing the mean annual increment of the forest. This is particularly noticeable in the moisture areas such as Kuttalam and Mundanthorai. The most harmful are *Petrolobium indicum*, *Acacia intsia*, *concinna* and *pennate* and *Zizyphus rugosa*. *Caesalpinia mimosoides* frequently forms a thick matted scandent growth and is a troublesome weed in clearings. In the evergreens enormous climbers do a lot of damage by smothering the crowns and constricting the boles of trees. *Ficus* species are scattered over the forest and do some damage by suppression of the more valuable tree species and sometimes constricting the boles of trees. They are not wholly injuries however, as in the Alagarkoil Valley, sandal regeneration is strikingly good under *Ficus* trees, owing probably to the fact that they attract many birds when in fruit, and these assist in dispersal cf sandal seed. In the Kudiraimozhi Teri reserve *ficus* cuttings are invaluable for afforestation purposes.

Loranthus is present but cannot be said to have assumed any serious proportions as a pest.

Prickly-pear, an important pest in other divisions is hardly to be met with here owing probaly to the past activities of the Cochineal insect. *Strobilanthens* is an important pest in all moist asreas of the division. Its gregarious habit and its dense rapid growth enable it to cover complete large areas in short periods and thus swamp natural seedling and coppice growth completely. It is the strong light demanders like teak that suffer most. There is a clause in all fuel coupe agreement that this weed should be uprooted in all coupes wherever it occurs, but either this condition is not enforced rigorously or the treatment does not meet the case. The former view appears to be more probable, as it has been definitely proved elsewhere that cutting the weed below its prop or stilt has been successful as an eradication-measure. As this weed is a serious menance to attainment of normal stocking in the fuel series rigorous measures for its eradication are called for. It appears to flower and die gregariously on the same area once in about 10 years, and a considerable revenue has been derived from its sale for fuel. *Vide* the table below which applies to the period 1922–23.

Serial number.	*Place or locality.*	*Amount realized.*	*Time allowed for removal.*
		RS.	
1	Padarmalai and Koilteri Working Circle.	150	1st July 1921 to 30th June 1922.
2	Kalakad Working Circle	105	Do.
3	Terku Veeravanallur	180	1st March 1922 to 30th June 1922.
4	Kadayanallur and Krishnapuram.	182	15th June 1922 to 15th October 1922.
5	Athithondu Section	2,200	15th January 1923 to 30th September 1923.
6	Mudangiyar Section	710	Do.
7	Pudupatti Section	700	2nd February 1923 to 30th September 1923.

Serial number.	Place or locality.	Amount realized.	Time allowed for removal.
		RS.	
8	Athithondu Section	255	3rd July 1924 to 2nd January 1925.
9	Mudangiyar Section	150	Do.
10	Do.	215	3rd September 1926 to 2nd March 1927.
11	Pudupatti Section	50	Do.
12	Athithondu Section	405	Do.
13	Kadayanallur. Krishnapuram ..	250	26th October 1929 to 25th March 1930.
14	Kodamadi Range	215	4th March 1930 to 3rd May 1930.
15	Terku Veeravanallur (including Manpothai).	17	5th March 1933 to 30th June 1933.
16	Kalakad and Vadagarai South ..	33	Do.
17	Malayadipudur (South and North).	17	Do.
18	Tirukurangudi and Parivarisurian (South and North).	27	Do.
19	Athithondu Section	181	Do.
20	Mudangiyar Section	36	Do.
21	Pudupatti Section	51	Do.

Unfortunately there is no demand for the green weed or eradication measures on a large scale might have been a paying proposition, instead of being too expensive. Much can be done, however, to control the weed by introduction of a clause in all fuel coupe agreements, which must be rigorously enforced, insisting on the cutting of all *Strobilanthes* in the coupe below its stilt roots at the time of felling. Prompt measure taken to sell the right to collect and remove flowering *Strobilanthes* will contribute towards minimizing the fire risk involved in having large areas of dead *Strobilanthes* scattered over the forest, and also assist in reducing the incidence of the past, as much of the weed will be removed before it has seeded. It is essential, however, that removals should be capable of being adequately controlled by the subordinate staff, and for this purpose the unit of sale should be small, preferably a Forest Guard's beat, and the voidah limited to not more than three months.

50. *Fungi.*—The number and variety of the fungi present in the division would make it a paradise to the collector. The huge bracket shaped *Polyporous* fungi seen in the evergreen sholas are a feature of the tract many of them, however, being saprophytic. Ground fungi, both poisonous and innocuous, are to be found scattered over the forest floor. Recently a fungus has been discovered doing great damage to and ultimately killing the young teak in patches in the plantations. The fructification has been sent to the Forest Botanist, Dehra Dun, for identification. The damping of seedlings in patches particularly in evergreen nursery beds, which are congested, is of common occurrence and should be guarded against by thinning out such beds, an operation which has been found by experience to be effective. Teak nurseries are also affected by an unidentified fungus with white underground hyphae. Here again the disease appears to be due to congestion as, when the seedlings are notched out at an espacement of four inches by four inches, they are not affected.

51. [*Insects.*—Defoliators and skeletonizers (*Hybloea puera* and *Hapalia macharlis*) are present both in the teak planatations and to a less extent in the fuel series containing teak. Beyond a possible loss of the year's increment no more serious damage is done.]

Damage by *Melonlonthid* larvae, so common a pest in nursery practice, has not yet made its appearance, but with the establishment of semi-permanent nurseries contemplated under this plan, this pest is likely to assume serious proportions.

Borer damage has not been noticed to any appreciable extent in teak. *Hopea* poles at Kariar were found killed by the borer *Massiscus venustus.* In this form of damage, the point, or more frequently points, of attack were within five feet above ground level usually 3—4 feet. The larvae make extensive galleries in the sap wood spirally up and down whilst young, and eventually bore about 1—1½ inches into the wood to pupate. The tree appears to die by being girdled. The damage to *Mesua ferrea* done by a Cerambycid borer, unidentified, is, however, much more extensive almost every tree over 1 foot girth being riddled by longitudinal and radial tunnels. The wood thus becomes quite unfit for railway sleepers, its principal use, and even under the most careful utilization the outturn in sleepers of the best trees of 7 feet girth is only in the vicinity of 35 per cent. It does not seem advisable to spend money on the artificial propagation of this species until some effective method has been discovered to control the pest.

52. *Animals.*—Elephants usually restrict their activities to the reed areas. Occasionally, however, they come down to the plains during the monsoons and do damage chiefly to the sandal in Alagarkoil valley. A narrow gorge has been blasted just at the point where the Mudaliaruthu-Puliuthu bridle path crosses the Pemalai ridge. It is the belief of the ryots on the plains, that this is the *only* way whereby elephants can descend from the hills into the Alagarkoil valley, as previous to the construction of the bridle path, elephants were not known to visit this valley. With a view to preventing elephants from descending into the valley and destroying their crops, the local ryots, so they say, placed a strong wooden plank studed with big iron nails with their business points exposed upwards, across

this gorge. This device was very successful in keeping the valley free of elephants for a couple of years, after which the obstruction was removed, according to the villagers, under the orders of the District Forest Officer. No official confirmation of this is discoverable in the records, but the problem of blocking the path for elephants *only* seems to be worth investigating both in the interests of the ryots and the valuable sandal growth in the valley.

Sambhur are responsible for a lot of damage to teak coppice shoots on the Mundanthorai plateau. The leading shoots are stripped of all the bark and die, being replaced by side shoots which are again similarly stripped. An enumeration carried out over a particularly bad area in the Koilteri Series showed that 88 per cent of the teak stools had been thus damaged. Fortunately this sort of destruction is restricted to the Mundanthorai plateau, where the sambhur have increased appreciably of recent years owing probably to the disturbance in the balance of nature, caused by the excessive destruction of carnivora on the plateau. Mundanthorai is an easily reached and very attractive shooting camp with the result that sportsmen frequently visit it with disastrous consequences to the tigers and panthers. Permission to shoot female and immature sambhur, with view to reducing their numbers was accorded in 1932, but was immediately withdrawn under the orders of the Chief Conservator of Forests as being liable to abuse in the absence of adequate control. It is considered that prohibition of the shooting of carnivora on the Mundanthorai plateau would, in time, restore the balance of nature. Fencing the whole of the annual coupe in the Padarmalai and Koilteri Felling Series where this type of damage is prevalent, is impracticable on account of the expense, as the annual coupe is about100 acres in extent in each series and fencing for at least three years after felling would be necessary. The only course would be to organize beats for sambhur under departmental supervision with a view to reducing their numbers.

Rats and *porcupines* damage evergreen nurseries by eating up the fleshy cotyledons of young seedlings. Wild pig exhibit a great avidity for the cotyledons of Balanocarpus utilis but they also do good to the forest by raking up in the soil in search of edible roots. Monkeys also are voracious consumers of many wild fruits and seeds; those of *Cluta travancorica* are, however, in exception. The leading shoot of *Artocarpous hirsuta* seedlings is frequently broken off and eaten by them. The Malabar squirrel is partial to seeds of *Dysoxylum malabaricum*, *Chukrassia tabularis* and *Acrocarous fraxinifolius*.

53. *Grazing.*—The grazing incidence has been worked out at an average of 6.9 acres per cow unit. This is correct in theory but in practice the incidence varies inversely with the distance of the grazing area from the village. The outer slopes containing the majority of the fuel series are therefore grazed most heavily. Many of the so called hill grazing compartments are never visited by graziers owing to the fact that they are more than a day's march from villages, and penning in them has been prohibited as no agreement could be arrived at between graziers and the forest department on the important question of prevention of fires. There is, however, a distinct demand for the grazing in the following hill grazing compartments provided penning is permitted.

Compartment five of Srivilliputtur Range.

Compartments 10 and 13 of Kuttalam Range.

A system of permitting penning in these compartments on condition that fire is rigorously excluded, would if popularized greatly relieve the present pressure, on our fuel series. There is no question of the possibility of this privilege being abused by the ingress of foreign cattle, because the local ryot is emphatically not a stock breeder and the grazing on the hills is neither so extensive nor good as to attract cattle from other localities.

54. *Semi wild cattle.*—The semi wild cattle some 400 in the Kudiraimozhi Teri Reserve and about 300 in the Vallanad Reserve also do immense damage to the regeneration in these reserves, besides causing great damage to crops in the cultivated lands surrounding these reserves. These cattle owned largely by Maravas who are usually landless, are let loose in the reserves unattented in order to evade the payment of grazing fees, and because local pattadars charge a higher grazing fee Re. 1 to Rs. 1–4–0 per head of cattle, for grazing in their patta lands. In times of drought these cattle feed in the forest, while when the crops are on the fields, they emerge from the forest and destroy the crops in the fields usually at night when their depredations cannot be checked. Long habitation in the forest has rendered them extremely shy of man and too ferocious to be caught. As a result of representations made to Government by the surrounding ryots, who complained of the destruction of their crops, the Maravas were at first compelled to enter into an agreement not to release their cattle from the village pen at nights. This agreement was not adhered to and in Government Order No. 554, Revenue dated 1st March 1911 it was ordered that all semi wild cattle in Vallanad Reserve should be shot after due notice to the villagers to remove their cattle The reserve was accordingly closed to grazing as a temporary measure in July 1912 aft 3 months notice in the District Gazette and shikaris permitted to shoot the cattle in th

reserve without a licence. Only 4 heads of cattle were thus destroyed. The District Forest Officer subsequently reported that it would be far more satisfactory to capture the animals than to shoot them, as far less curelty was attached to the former practice and a greater profit would result to Government as a carcass sold for about Rs. 4 while a live animal would fetch from Rs. 30 to Rs. 40 especially as they could easily be tamed in a month. The Conservator accordingly ordered that capturing was to be *preferred* to shooting.

Tenders were accordingly called for, and a very favourable one was received wherein the tenderer offered,

(*a*) to pay Rs. 20 for each head of cattle captured, cow, calf or bull.

(*b*) the material for stockades was to be provided by department but the cost of felling and transport would be borne by the lessee.

(*c*) the period of the lease was to be one year.

This tender was unfortunately not accepted as the Conservator was averse to the grant of a one year lease in the interests of grazing ; as the reserve had to be closed to grazing for this period. He also demanded a guarantee from the lessee that the whole of the reserve would be rid of cattle, and this, the latter rightly refused to give. Departmental " keddah " operations were accordingly resorted to in 1920–21 and a special duty Ranger and Forester posted in charge of the operations. Two stockades erected at a cost of Rs. 788 and 26 head of cattle captured and sold for Rs. 513. A revenue of Rs. 299 was obtained by the sale of materials of the stockades, so that excluding expensive overhead charges a small profit of Rs. 24 was secured. Further details are available in R. Dis. No. 7 of 1921 of the Tirunelveli District Forest Office.

The discouraging results of departmental working led to the encouraging of private enterprise to capture the animals by netting. Licences were accordingly proposed to be granted to individuals in 1925 on condition that the 50 per cent of the sale proceeds of all animals caught would be given to the licensee. This offer did not prove sufficiently attractive, the prospective licensees sticking out for 2/3 of the sale proceeds. In 1929 a second attempt was made, the licensee being offered $\frac{3}{4}$ of the sale proceeds of all animals caught by him. Altogether 39 animals were caught and a revenue of Rs. 360 less 75 per cent commission realized. The operation was brought to a sudden termination because one of the licensees was prosecuted and convicted, of having stolen a bullock. The supineness of the Ranger in having permitted the prosecution to take its course without aiding the licensee was a regrettable feature of the case.

Another attempt was made in 1945 with Government sanction (G.O. No. 3701, Development dated 24th September 1945). Seventy-one animals were captured and sold for Rs. 3,910 of which $\frac{3}{4}$ went to the contractor who captured them. Even then it cannot be said that the operation was successful. Capturing operations are not likely to meet the case as the ryot who owns the cattle knows that he can claim them when captured, or failing this buy them cheaply at the ensuing auction and put them back in the reserve for grazing. These alternatives are not present in the case of dead animal. Not until owners are convinced that the conversion of these reserves into private grazing grounds principally for their benefit will not be tolerated, will the problem of semi wild cattle be solved.

55. *Man.*—Situated as the forests are, close to cultivation on the populous plains, it is not surprising that the forest offences reported are numerous. The blood of their marauding and pillaging ancesters still runs, although in an attenuated form, in the Maravan and Thevan of to-day. The result is a constant defying of authority, and subordinates are frequently intimated by the young bloods of the village so that many offences are not reported by them. One useful result of this however deserves comment. The District Forest Officer is almost invariably informed by the ryots by numerous anonymous or pseudonymous petitions as soon as the illegal acts or exactions of particular forest subordinates have become too oppressive. Many of these petitions are patently exaggerated but careful enquiry will almost invariably disclose a substratum of truth. Illicit grazing in closed areas and illicit felling of small timber and fuel are the principal offences. The ryot wants a particular shaped piece of timber for his plough and usually prefers to get it himself from the forest, and take what he considers the paltry risk of being caught, rather than get it from the stock in the forest contractor's depot. Protection against injury from man is generally satisfactory in the interior forests but not so in the jungle forests close to villages wherefrom removal of fuel by head-loads is rampant under cover of permits issued by coupe contractors.

56. *Manure leaf.*—The removal of manure leaf from the forests of Nanguneri and Srivilliputhur Ranges is permitted on payment of 2 annas 6 pies per head load. This rate has since been reduced to 1 anna 3 pies as a temporary measure in G.O. No. 2220, Development,

dated 17th October 1942 (C.C.P. Mis. No. 304/42, dated 2nd November 1942). The revenue realised for the period from 1922–23 to 1946–47 is shown below :-

Year.	*Total.* RS.	A.	P.	*Year.*	*Total.* RS.	A.	P.
1922–23	4,375	0	0	1935–36	46	0	0
1923–24	..			1936–37	138	14	0
1924–25	8,585	0	0	1937–38	14	3	9
1925–26	7,220	0	0	1938–39	13	12	0
1926–27	3,801	0	0	1939–40	18	7	0
1927–28	5,847	0	0	1940–41	212	10	6
1928–29	1,977	0	0	1941–42	127	7	0
1929–30	3,131	0	0	1942–43	173	8	3
1930–31	2,445	0	0	1943–44	894	11	0
1931–32	1,178	0	0	1944–45	274	11	6
1932–33	893	11	0	1945–46	209	14	9
1933–34	215	10	0	1946–47	211	15	0
1934–35	113	2	0				

This pernicious system once prevalent over the whole division has been partly responsible for the progressive deterioration of the Simple Coppice Fuel Series on the lower slopes of the ghats. In theory no removals of leaves of fuel and timber species is permitted but in practice it is difficult to enforce this. However, as the policy of the Government now in vogue is to encourage sale of green manure, the possibility of farming manure leaf plantations on a small scale is indicated.

57. *Illicit offences.*—The following statement shows the number of cases reported under the main heads for the period from 1923–24 to 1946–47:—

Number of forest offences.

	Grazing.	*Felling.*	*Hunting and fishing.*	*Assault on subordinates.*	*Miscellaneous.*	*Total.*
1923–24	209	499	3	1	13	725
1924–25	210	510	8	..	15	743
1925–26	185	540	12	..	7	744
1926–27	127	475	7	1	12	622
1927–28	186	511	4	..	12	713
1928–29	187	521	10	1	6	725
1929–30	176	441	..	1	8	626
1930–31	163	396	5	1	17	582
1931–32	183	498	10	1	11	703
1932–33	123	376	9	..	18	526
1933–34	205	306	2	..	21	594
1934–35	165	371	16	1	31	584
1935–36	133	369	15	..	30	547
1936–37	116	377	..	..	12	465
1937–38	140	403	9	2	26	580
1938–39	125	372	8	1	12	518
1939–40	148	391	6	..	9	554
1940–41	161	482	..	..	34	677
1941–42	77	406	1	..	51	535
1942–43	125	369	8	..	24	526
1943–44	116	373	6	..	35	530
1944–45	81	674	7	..	24	786
1945–46	77	708	..	..	34	819
1946–47	75	692	8	2	40	817

The average annual revenue derived from compounding fees in the division during the above period was Rs. 6,325. The increase is due to high compounding fees levied by the District Officers in very recent years with a view to put down theft.

SECTION 3.—FAUNA.

58. *General.*—The scarcity of game has been a lament of every Forest Officer for the last decade. Wild pig, spotted deer and sambhur are still fairly numerous on the Mundanthorai plateau, and in Puliangudi and Vasudevanallur beats of Kuttalam range, elsewhere especially round Kuttalam, in the Sivasailam hills and in the Kalakad series, with the exception of pig, game is very scarce. Illicit shooting in these three localities has assumed serious proportions, and there is little doubt that the forest subordinates connive at, and derive a considerable revenue from this poaching as venison is highly prized among the local population, and skins are esteemed as house hold adornments. professional shikaries are numerous and display an almost uncanny knowledge of the principal water-holes and salt-licks round which old *machans* are almost invariably seen. Since, in the long hot weather, game is forced to visit such places owing to the general scarcity of water, its destruction is comparatively easy. The grant of licences to the local population, ostensibly for the protection of their field crops, is also largely responsible for this destruction, as they are utilized for hunting in the reserved forest. Licences issued specifically for the pursuit of game in the reserved forests are comparatively few, averaging 16 per annum. Since the

writing of the last plan there has been a long period of war when arms and ammunitions have been scarce. This has resulted in there being more plentiful game in the reserves than heretofore. Black buck, bison, tiger and panther are to be found in fair number. There is however a tendency now for poachers to get into full swing with ammunitions more readily available. Game preservation could be promoted by the following measures :—

(1) The exercise of a greater amount of discretion in the issue of shooting licences. There is a " black list " maintained in the District Forest office which does not appear to have been consulted in the issue of shooting licences. A licence for retainers should be issued only if the District Forest Officer is convinced that the licensee is not likely to abuse the privilege. It is deplorable that many so-called sportsmen take out a licence only to enable their retainers, usually skilled shikaries, to shoot game for them. Such a lack of sportsmanship should be rewarded, on discovery, by the posting of the delinquent's name on the " black list".

(2) Forest subordinates should be rewarded on a more generous scale for good work in game preservation ; at present, considering the temptations to venality, it is hardly surprising that many of them follow the more profitable line of least resistance.

Finally, it must be emphasized that no satisfactory conservation of game can be accomplished unless the District Forest Officer is personally enthusiastic in the matter, and shows his subordinates that he is interested, both by rewarding good work generously any by punishing bad protection severely.

Black buck are fairly common in Vallanad reserve, and merit special protection, as they have disappeared from the panchayat area where they were once numerous.

Bison.—There is a small herd of bison which frequents the sholas and grass areas around Netterikkal. Bison spoor has also been observed in the Mungilpatti Kidai valley of Nanguneri range. Elsewhere in the division they are absent.

Carnivora.—Tiger and panther are found occasionally mainly on the Mundanthorai and Kalakad plateaus. The shortage of game probably accounts for their comparative rarity elsewhere.

Bear.—The black bear haunts the shola forests throughout the division.

Ibex.—Ibex are found scattered over the division, their main habitat being the precipitous and grassy hills above 4,000 feet elevation. The principal haunts of this animal are—

Nanguneri range	Tiruvannamalai. Naduterrimottai. Panjantangimottai.
Ambasamudram range	Chinnadoomottai. Periadoomottai.
Kuttalam range	Variadoomottai. General's hill. Kulirattimottai.
Srivilliputtur range	Peimalaimottai. Sambangikidaimottai.

The localities in Ambasamudram range are the most easily accessible and are therefore the most heavily poached. The need for preserving this interesting and rare wild animal from rapid extinction is very pressing.

Barking deer are comparatively rare though fine specimens in the Puliangudi beat of Kuttalam range have been seen.

The sholas contain monkeys mainly of the langur variety and the Malabar squirrel is quite common.

59. *Game birds.*—The jungle fowl is common throughout the division. Patridge is to be met with in type I forest, principally in Vallanad, Rangarkoil and Valaikulam reserves. Green pigeon are fairly common on the inner slopes especially along the various stream and river banks. The imperial pigeon is comparatively common in the less accessible shola forests.

Other birds of note in the shola forests are the greater horn-bill, the whistling school boy, the racket-tlaied drongo, the scarlet minivet and the hill mynah.

In the lower forests the usual bird life of South India is abundantly represented, and many most beautiful birds such as the paradise fly-catcher, the golden oriel, the barbets, the red-vented bulbul, etc., are frequently to be seen.

60. *Snakes.*—The hamadryad is alleged to frequent rivers and streams in the shola forests but we are not able to confirm this. As a matter of interest the writer came across the tanned skin of an undoubted hamadryad shot near five-falls in Kuttalam range, 14 feet 2 inches in length. The cobra and the krait are however too common for comfort especially in the wooden sheds in the hills. Rat snakes are frequently to be met with but are not poisonous.

CHAPTER III—UTILIZATION OF THE PRODUCE.

SECTION 1.—AGRICULTURAL CUSTOMS AND WANTS OF THE POPULATION.

61. *Population.*—The population of the Tirunelveli district according to the latest census of 1941 excluding Anjengo sub-taluk amounts to 2,074,436 or on an average to 550 to the square mile. The only taluk of Ramanathapuram district with which we are concerned, namely, Srivilliputtur, has a population of 273,963 or 635 to the square mile.

The population is mainly agricultural, both dry and wet crops being grown. Rice cultivation occupies one-fourth the total cultivated area of the Tirunelveli district, the proportion in Ambasamudram taluk which possesses the best wet lands irrigated by the Tambaraparni raising to two-thirds.

62. *Wants of the people.*—The chief forest requirements of the people are small timber for building and agricultural implements, fuel for domestic consumption and for cottage industries such as jaggery making, lime and brick kilns, pottery, etc.; pasture for cattle, thatch grass, and to a decreasing extent, leaf manure for the wet cultivated fields.

63. *Agricultural implements.*—The farmers' stock in trade of implements is small; a light wooden plough for use in puddled fields, and a slightly heavier one for use when the field ploughed is a comparatively dry state for broadcast sowing; a wooden plank for use in levelling the surface in wet fields, a *manvetti* or spade for light hoeing and a clod-breaker for breaking up the ploughed up soil.

The plough consists of the handle, plough-share, shaft and yoke. Of these the plough-share requires most frequent renewal as it is most subject to wear. It has been ascertained from enquiry among the ryots that the plough-share has to be renewed annually for dry cultivation and biennially for wet cultivation and the average stock of plough-share required being one per acre of cultivation. The remaining portions of the plough are only renewed triennially. The following table shows the species most prized for the various parts of plough and other agricultural implements in the order of preference :—

Plough-share ..	*Chloroxylon swietenia, Acacia arabica, Albizzia amara* and *Mesua ferra.*
Shaft	*Mesua ferra, Grewia tiliaefolia,* teak.
Handle	Teak.
Yoke	*Pterocarpus marsupium,* teak. In addition any other species most easily available are used for the yoke and the handle.

The species most in demand for parts of country carts are in the order of preference :—

Spokes	*Aglaia roxyburghiana, Grewia sp.,* teak.
Felloes	Teak mostly.
Baulks	*Acrocarpus fraxinifolius, Dipterocarpus bourdilloni. Hardwickia pinnata, Plaquium ellipticum, Pterocpermum rubiginosum.*
Cart-shafts ..	*Palaquium ellipticum* and *Hardwickia pinnata.*
Wheel boxes ..	*Hardwickia binata, Acacia arabica, Pterocarpus marsupium.*

64. *Houses.*—In the rich Tambaraparni valley tiled houses are common, only the houses of the poorer labourers being thatched. In all the villages lying along the foot of the hills, thatch is rapidly giving place to tiles as a roofing material and this naturally means more substantial buildings or brick or stone and mud. Kongu (*Hopea parviflora*), a timber which possesses a peculiar facination for the people of the division, is very extensively used even in preference to teak for building material, the local slow grown teak being highly prized for door and window-frames and rafters.

65. *The palmyra.*—There is no single product of the division which provides an occupation for so large a number of its inhabitants as the palmyra (*Borassus flabelliformis*). There are over ten millions of them scattered over the whole of the plains of the division, and a large number in the Kudiraimozhi Teri Reserves; it has been estimated that roughly five per cent of the population depend for their livelihood upon this tree. An ancient Sanskrit poem enumerates 801 uses to which the tree can be put, and a local Tamil proverb declared with more exaggeration than truth, that the palmyra lives for a thousand years, and continues to last when cut for another thousand years. Its durability is however unquestionable and accounts for its extensive use as rafters. Fibre for brushes and

rope-making is extracted from the leaf stalk which is also used as fuel. The leaf is used for thatching and basket-making The tender fruit contains a translucent jelly like endosperm which is greatly relished. The inflorescence on both male and female trees is tapped for the sap which exudes from it.

The tapping season commences in February and continues up to June. The daily yield of a normal tree varies between half to one Madras measure according to the number of spathes tapped. Left to itself the juice quickly ferments, and if fermented sap or toddy is not required, the interior of the pot is lined with lime. Only a small proportion of the sap produced in the division is utilized for consumption either as a sweet drink (pathanir) or as fermented liquor. The rest is boiled to produce either a coarse of sugar known as jaggery, or more rarely, is purified into palm candy sugar. The boiling of palmyra sap is thus an important industry consuming large quantities of fuel of small dimensions, below 6 inches girth, as the larger sized fuel is useless for the purposes, a quick hot fire being the principal desideratum.

66. *Mats.*—Mats of varying degree of coarseness (the maturer the leaf the coarser the mat) are made from palmyra leaves in large quantities both for export and local consumption. Excellent mats of *Korai* grass are manufactured, mostly by Muslims, the price varying according to the texture.

67. *Small timber.*—The small timber that the Government forests supplying judging from the contractors' accounts of removals for the decennium 1923–32, amounts on an average to about 1,500 tons per annum. But during the war period exploitation in the shape of small timber was given up as the contractors found sale as fuel more profitable. From 1934–35 to 1945–46 the removal accounts show that the total removal of small timber from Government forests through private agency was 225,394 cubic feet or on an average of 18,783 cubic feet or 3,750 tons per annum. The demand is estimated to be in the vicinity of 5,000 tons per annum. The balance has been met principally from the adjoining Travancore State and zamin forests, and to a lesser extent from the extensive patta lands of the Nanguneri Mutt in Nanguneri taluk and the Tiruvaduthurai Mutt in Tenkasi taluk. Owing to unrestricted cutting and felling under too short a rotation (10–15 years) the supply of small timber from the zamin forests is likely to disappear in two or three decades. The necessity for conserving and extending our resources in this respect is indicated.

68. *Fuel.*—The fuel requirements of the division are very large. Mr. P. M. Lushington as a result of personal investigations in 1919 estimated the fuel consumption to be in the neighbourhood of 200,000 tons per annum. The village and rural demand is comparatively insignificant as the ryots use mainly palmyra, cotton and castor stalks, palmyra leaves, cowdung cakes and such brush wood fuel as is obtainable on village grazing grounds. A common agricultural custom of the ryot in the plain taluks deserves mention. Where the soil is too poor to yield an annual crop, the ryot after harvesting his crop, pens sheep and goats fed on *Acacia planiforns* pods on the land. The passage of the seed through the alimentary canal of these animals appears to have a remarkable effect on its germinative capacity. The dung mixed with seed which is obtained is broadcast on the ploughed ground and if the rainfall is propitious, crop of young seedlings soon results. This is carefully guarded from goats, etc., and within 6–8 years the plot is felled over and recultivated with field crops. The fuel from this source forms a valuable supplement to agricultural income, besides improving the fuel supply of rural areas which have been denuded of practically all natural tree growth. Again there are a number of areas scattered over the plains, chiefly tank-beds, over which under the provisions of rules framed under section 26 of the Madras Forest Act, the Forest Officer exercises a very limited control. These areas, some 18,000 acres in extent, known as " Unreserved lands " are under the direct control of the Revenue authorities. The chief growth consists of babul (*Acacia arabica*), the wood of which is in great demand for fuel and agricultural implements. No restriction of grazing is enforced in these areas, and this combined with the fact that babul does not coppice, has resulted in the progressive destruction of this important fuel resources in the plains, The revenue from this source which averaged Rs. 15,000 per annum in the eleven years' period 1885–86 to 1895–96 dropped to an average of Rs. 1,160 per annum for the decennium 1923–32. Details of figures for the years 1934–35 to 1946–47 are not available as revenue from unreserves are no longer credited to the Forest department.

It is only from the villages situated near the hills that women, and less often men, go and spend their time in the fuel coupes collecting fuel on payment to the contractor of seigniorage of 2 annas a head load. It is the policy of the Forest department to distribute fuel coupes as widely as possible with the object of bringing cheap fuel to the ryot's door.

The larger fuel in the more remote fuel series is usually converted in situ into charcoal for which there is a keen demand. From the fuel series situated within economic distance of the railway, the larger fuel is transported to the big towns, Tirunelveli and Palayamkottai, consuming some 40,000 tons of which Government forests supply only about 5,000 tons. The contractors of the fuel series situated in the northern part of the division, namely, the

Puliangudi, Karuppusamikoil and Vasudevanallur Series in Kuttalam Range and Ayyanarkoil Series in Srivilliputtur Range, find it more profitable to transport their fuel to Madurai by rail for sale. In recent years it was found that a sudden unexpected increase in the demand for fuel was felt due to conditions prevailing on account of war. There was no movement of coal from the north to the south apart from transport difficulties and so the industrial concerns depending on coal had to fall back on firewood. Shortage of petrol also necessitated the conversion of large quantity of firewood into charcoal to be used for motor vehicle with gas plants. Consequently from 1944–45 onwards extra areas had to be worked to meet the fuel demand. Advance coupes were sold from 1946–47 onwards.

69. *Timber.*—Big timber for constructional work is largely obtained from the Travancore State forests by rail through the Shencottah pass, and by road through the Achenkoil and Aramboli passes. Teak, *Hopea parviflora*, *Dalbergia latifolia*, *Dipeterocarpus bourdilloni*, *Adina cordifolia*, *Magifera indica*, *Artocarpus hirsuta* and *Vitex altissima* are the principal timber exported.

Favourably situated as the Shencottah division of Travancore State, is right on the Tirunelveli frontier, more than 75 per cent of its annual output is sold to merchants from the Tirunelveli, Ramanathapuram and Madurai districts. There will however be considerable restriction hereafter as the Travancore State propose to retain their timber for their large scale building plans.

A certain amount of timber, mainly "junglewood" is supplied principally to the sea ports of Tirunelveli from the West Coast, the transport being effected by native craft.

Burma teak enters the Tirunelveli division at Tuticorin and is largely used for the best constructional work, being conveyed by rail to most of the principal towns in the district. This supply was stopped from the outbreak of the Second World War. It is only from 1947 onwards, Burma Teak is just beginning to come in. Besides this, there has been a vast and annually increasing output of teak pole from the thinnings of the Travancore State Teak plantations which were 10,672 acres in extent in 1930–31 and are increasing at the rate of approximately a square mile per annum. The felling of the final crop has not yet been started, the oldest crop being now about 80 years old and the tentative, rotation 80 years. The decision of the State, repealing the statute declaring teak, rosewood "Royal trees", from 16th August 1941, has resulted in the concentration of the State Forest Department's activities on the extraction of all exploitable trees of these species found on private holdings, on a regular plan. The result would have been overproduction and a consequent fall in the prices of these valuable timbers in the markets of the division, but for the outbreak of War in 1939. The only big timber which the division can supply is evergreen timber, both the rainfall and soil conditions prevailing over most of the forests not being conducive to the production of big timber of deciduous species. The local demand for evergreen timber has been estimated by various Forest Officers to be about 10,000 cubic feet. Investigation made into the demand point to a much higher figure namely 40,000 cubic feet for the Kallidaikurichi market alone. Here again the crux of the problem lies in economic working. If extraction costs are kept below the prevailing market rates which are governed principally by the output of the Shencottah State Forests and Singampatti Zamin, there would be no difficulty in disposing of the whole of the output under this plan.

70. *Sandalwood.*—Up to date, following the prescriptions of Mr. George Venugopal's tentative Working Plan, and that of Mr. Lasrado only dead trees and trees broken by elephants have been extracted from the Alagarkoil valley of Srivilliputhur range under the Sandalwood Extraction Rules. The mean annual yield being in the vicinity of 3½ tons. Extraction was started in 1923–24 but unfortunately the work was not done in accordance with the Sandalwood Extraction Rules till 1930–31. The quantity of dead sandal trees extracted from this division for the decennium 1937–38 to 1946–47 is given below :—

	TONS.	CWT.	QR.	LB.
1937–38	2	8	0	16
1938–39	2	8	1	24
1939–40	2	7	1	13
1940–41	5	1	1	16
1941–42	13	3	0	6
1942–43	14	1	16	6
1943–44	21	3	2	0
1944–45	4	13	0	0
1945–46	3	19	2	0
1946–47	5	15	2	10

All the sandal extracted in the division is final cleaned and sent to the Tirupattur sale depot where it is auctioned along with the Vellore sandalwood. The local demand mainly for religious ceremonies and household use is met by private merchants who import the wood via Tuticorin from Bombay. This sandal is mainly Australian, and the billets are beautifully cleaned and polished. Although it is inferior to Indian sandal in scent

and oil content, it is bought wholesale at Rs. 1,260 per ton and sold retail in Tuticorin at Rs. 1,344 per ton. The annual imports of this wood into the port of Tuticorin are given below :—

	Weights.		
	TONS.	CWT.	LB.
1922–23	32	16	28
1923–24	18	5	84
1924–25	44	4	56
1925–26	41	14	0
1926–27	27	3	40
1927–28	39	8	84
1928–29	41	15	28
1929–30	32	12	56
1930–31	25	15	28
1931–32	18	0	56
1932–33	16	0	35
1933–34	23	1	22
1934–35	13	6	37
1935–36	28	11	28
1936–37	25	15	22
1937–38	19	11	27
1938–39	10	5	13
1939–40	36	10	25
1940–41	39	6	34
1941–42	28	15	41
1942–43	25	10	8
1943–44	8	6	10
1944–45	12	15	28
1945–46	4	4	13
1946–47	2	3	13

The average annual imports for the decennium 1937–38 amount to 19 tons. The annual demand in Tuticorin is about 2 tons, in Palayamkottai and Tirunelveli about 4 tons, the rest of the division taking according to the sandalwood merchants about 2 tons. The greater quantity of the imported sandal is sent to Tiruchirappalli and Madurai where it is used both for *bona fide* religious and domestic purposes and for illegal purposes such as adulteration of the sandal illicitly abstracted from the reserved forests of the South Salem division. The need for exercising the greatest circumspection in the registration of property marks and the grant of way permits is indicated.

There is some sandal in the patta lands adjoining the reserves in Srivilliputhur and Kuttalam ranges. Neither its distribution nor its value call for special comment. The local pattadars do not seem to set much store by the sandal on their holdings and none of it is extracted for commercial purposes. The Sembaga Tope, an area of about 300 acres at the mouth of the Alagarkoil valley in Srivilliputtur Range, is owned by the Srivilliputhur Temple Trustees and contains an excellent growth of young sandal, sample enumerations disclosing the presences of about 8–10 trees per acre about 6 inches girth. Extraction here is being done on small scale for the purpose of supplying the needs of the temple only. Although this crops is immature, the sandal is spreading rapidly and in time should be valuable.

The position in this division as regards patta sandal is quite different from that in other divisions, for example North Coimbatore, as Government here has no right whatsoever to any of the sandal on patta lands. As the quantity available is small and as much of the regeneration is periodically destroyed by burning by the pattadar, who is seemingly unaware of its value, the rapid spread of the sandal on patta lands is not probable : moreover the difficulty of enforcing any agreement will be great, since in this division such agreements will be unilateral (unless consideration is paid at the time of execution of the agreements) and therefore unenforceable by law. Adequate control over patta sandal working can be obtained by having recourse to the Sandalwood Transit Rules (Appendix III). In addition to this, it will be prescribed that attempts be made to induce pattadars to sell their sandal to us for extraction, vide paragraph 361 below.

71. *Bamboos.*—Bamboos form quite an insignificant proportion of the crop in the division. There is a great demand for this product, especially in the large towns, for the erection of scaffoldings, pandals, fences, etc. of recent years. Messrs. Harvey & Co., have started using bamboo slats expermentally for packing their cotton for export, and an extension of the demand may be anticipated. The supply at present is almost wholly met from the Travancore State forests ; and therefore, favourably situated as many of our reserves are from the point of view of extraction, the artificial introduction of bamboo in suitable areas seems desirable. In this connection it should be borne in mind that the bamboo is a comparatively cheap product ; hence it should be introduced only in localities where transport facilities permit of low extraction costs. The introduction of *Dendrocalamus strictus,* is not favoured as the optimum elevation for this species 2,500—3,000 feet, would preclude its introduction in localities from which it could be profitably extracted. *Dendrocalamus brandisii,* however has been successfully raised at elevations of

5–600 feet in the Wynaad division and its experimental introduction in this division in favourable localities, is desirable. *Bambusa arundinaces* has been grown in the division at elevations varying from 300 to 1,200 feet although on a comparatively small scale and the extensions of such plantations as are economically situated will be prescribed.

72. *The Eta reed.*—This produce is at present worked sporadically through the agency of minor forest produce contractors, who issue head-load tickets for its extraction from any locality in their respective farms where it occurs. This method of extraction touches only an insignificant proportion of the vast reed areas in the division, only the most easily accessible areas being worked. The annual amount extracted is about 50 tons. Enquiries made into the possibility of working the more easily accessible areas by the system of located fellings by coupe contractors, have definitely pointed the fact that there would be no demand for such coupes. The reed is of potential value as a source of paper pulp, and since details as to the best method of working it on the basis of sustained yield would be valuable, in case the development of hydro-electric schemes provides a cheap source of power and make the establishment of paper mills possible, such details as are available are given below :—

Area.—As a result of stock mapping done by the Forest Engineering Branch in 1925–26, 28 square miles of reed jungle of which 17 square miles consisted of pure reed and 11 square miles of mixed reed and tree growth, were located in Ambasamudram Range. The latter was estimated to contain 60 per cent reed growth. Thus the total reed area available amounts to $17\ \frac{(11 \times 60)}{100} = 23{\cdot}6$ square miles or about 15,100 acres.

Method of working.—Silviculturally, clear felling of the reed was found experimentally to be detrimental to its regeneration. The following statement illustrating this, shows the results of experiment made by the District Forest Officer in 1925 :—

Original reed growth.	Date of observations.		
	March 1925.	*June* 1925.	*March* 1926.
Plot A— Half acre—Thick, with large sized culms and few trees.	Clear felled	Regeneration—fair ..	Shoots less than 5 feet high and 1 inch in girth. All shoots short, many broken by elephants.
Plot B— Half acre—Poor, culms small ..	Do.	Regeneration—poor ..	Regeneration dense, shoots less than 3 feet high.
Plot C— Half acre—Same as plot A ..	60 per cent of the culms in each clump felled.	Regeneration—good ..	Except for the presence of new culms in clumps in this plot show no signs of exploitation; new culms 3 to $3\frac{1}{2}$ inches in girth and about 15 feet high.

N.B.—The plots were near Kalavelipil in Ambasamudram Range.

The following details derived from enquiries made by Mr. A. Wimbush in 1925 in Travancore are also illuminating, and to some extent corroborative :—

(1) Clear felling of reeds is fatal to the maintenance of a sustained yield. It is considered that if a clump is clear felled it will have to be left alone for seven years in order to recover.

(2) Provided that a sufficient number of culms are left to feed the rhizomes, a felling cycle of 4 years is probably sufficient.

(3) The smothering of cut-over culms by the refuse from felling is to be deprecated, but the only District Forest Officer consulted on the point thought that burning of the debris would be much more injurious.

Exploitation.—In order to test the utility of this reed for making paper pulp, 2 acres of pure reed jungle near Woods Hut, were clear felled departmentally in 1926, and the produce sent to the Forest Research Institute, Dehra Dun. The yield was $17\frac{1}{2}$ tons of green weight or $11\frac{1}{2}$ tons of air dried weight of reed. This gives an output of $5\frac{3}{4}$ tons of air dried reed per acre under clear felling or an yield of $3\frac{1}{2}$ tons of air dried reed per acre if only 60 per cent of the crop is felled. It must be added that all top ends, leaves and branches have been excluded from these calculations. On this basis the reduced area of 15,000 acres, represents a total yield of 52,500 tons of air dried material. Under a felling cycle of 3 years the annual yield would be 17,500 tons. According to the Paper Pulp Expert 2 to $2\frac{1}{2}$ tons of air-dried reed would be required for a ton of paper pulp. Taking the higher figure therefore, the supply is sufficient for manufacturing 7,000 tons of paper pulp annually. The total cost of extraction and supply to rail head (Ambasamudram) amounted to Rs. 111

per ton air dried weight. As the reed had to be supplied at short notice, the work of extraction could not be well organized or controlled. The District Forest Officer at the time, held the opinion that with proper organization the cost of delivery at Ambasamudram could be reduced to Rs. 85 per ton with the existing methods of transport.

Under the direction of Mr. Raitt, the officer in charge of the Paper Pulp section at Dehra Dun, the reed sent from the division was converted into paper. He was of opinion that the reed made first-class paper pulp, yielding a fibre of exceptional length and slenderness, i.e., softness and felting quality. It was suitable for any grade of high class art printing and litho paper, being exceptionally free from dirt and matter producing objectionable specks on the paper. The cost of manufacture per ton of paper was—

	RS.	A.	P.
(1) Chemical process	20	8	0
(2) Bleaching	21	0	0

Mr. Raitt suggested that if a mill was erected at Mundanthorai about 10–12 miles from the reed areas in a straight line, the dry reed could be delivered at the mill at Rs. 15 per ton with the assistance of ropeways. Thus, on the basis of 2½ tons of dry reed to 1 ton of paper, the cost of the reed would be Rs. 37–8–0 per ton of paper. There was a prospect therefore of the cost of the raw material and chemicals up to the bleached pulp stage amounting to only Rs. 79 a ton, a figure which was not approached by any other raw material in the world. (The corresponding figure for the grass which is the staple for North Indian paper makers is Rs. 200 per ton and for the Bamboo Mills Rs. 160 per ton.)

Since the reed was a patch flowering species and was not known to flower gregariously the question of stoppage of supplies during a general seeding did not arise.

This satisfactory report by an expert who was universally known to be an authority on the subject, interested a number of European firms in the subject. Messrs. John Dickenson & Co., Ltd., may be quoted as an example; they stated this case as follows :—

(1) The scheme was highly speculative and not sufficiently attractive unless Government was prepared to share the risk

(2) The location was poor for a paper factory being very far from principal markets ;

(3) Hence before considering the scheme further, the company would like to know if the Government were prepared to

(*a*) construct power installation and provide power service to the factory at a low rate ;

(*b*) grant a concession for the ryots to cut and remove the reed on a seigniorage of Re. 1 per ton of dry material ;

(*c*) contract to take proportion of the factory output of not only paper, but envelopes, bags, account books, etc. ;

(*d*) obtain railway freight concession ;

(*e*) guarantee a certain interest on the investment, say 3½ per cent until the factory had reached a profitable stage.

In return for these concessions the company was prepared to erect a mill capable of utilizing 4–5,000 horse-power of electric energy with an approximate outturn of 5,000 tons of paper per annum.

The Chief Engineer, Hydro-Electric Division, reported that the consumption of 5,000 horse-power would not justify expenditure on the hydro-electric scheme. Attempts were then made to attract the attention of the cellulose and artificial silk interests to the scheme, with the idea of increasing the demand for power but met with no success. The scheme was therefore dropped on the advice of the Chief Forest Engineer as " not being commercially feasible at present ". The preliminary investigation into the various ropeway, railway and flume transport schemes, carried out by the old Forest Engineering Branch at considerable expense, proved disappointingly unproductive. The Chief Forest Engineer's Dis. No. 6153/27 contains—

(*a*) The survey of meter gauge railway from Ambur to Mundanthorai and proposed dam site with an extension to Kodamadai.

(*b*) The survey of main flume from reed areas to proposed impounded lake near Taravittanparai and one branch flume tapping the western portion of reed area.

(*c*) Maps of proposed ropeway routes and flume routes.

(*d*) Reconnaissance maps of Singampatti and Kalakad forests showing reed areas. All these details being now merely of academic interest are not embodied in this plan, but are filed in the Forest Engineer's office. At present, Messrs. Harvey & Co. appear to be interested in the Eta reed for paper making and the matter is under investigation.

73. *Manure leaf.*—The removal of manure leaf from the forest on payment of 2 annas 6 pies per head-load was permitted only in the Nanguneri and Srivilliputtur ranges. It is now permitted in all the ranges at the reduced rates of 1 anna 3 pies per head-load. Since many of the ryots in Nanguneri and Srivilliputtur have started growing their own manure leaf kolinji (*Tephrosia* sp.) under the aegis of the Agricultural department, a proposal was put forward by the District Forest Officer in 1930 to enhance the rate for manure leaf to 4 annas per head-load from 1931, so as to compel the ryot to grow increasing quantities of his own manure leaf and to rely to a diminishing extent on the forest supply. This proposal was supported by the Collector of Tirunelveli, but the Collector of Ramanathapuram while accepting the principle involved, considered it impolitic to raise rates at a period of acute agrarian distress. The Chief Conservator of Forests agreed with the Collector of Ramanathapuram and ordered that the proposal should be held in abeyance until agricultural conditions improved. As a matter of fact, Government finally reduced the rate as mentioned above, the cultivated manure leaf, kolinji, is at present sold at Rs. 15 a cart-load.

74. *Grazing.*—The forests above approximately the 1,500 feet contour are very steep and consequently not suited for grazing either from the point of view of the grazier or of the Forest Officer. They are covered with shola forest, thin semi deciduous forest or tall coarse grass; this latter provides grazing of poor nutritive value but is rarely eaten by cattle; if burnt, however, a crop of tender shoots is soon produced which is quite palatable to cattle. In the interests of the preservation of the water sources on which the irrigation in the plains depend, it is essential to protect such areas from fires; this can be accomplished only by prohibiting grazing in such areas.

The following table shows the various grazing compartment into which the forests are at present divided, together with an approximate estimate of the area available in each compartment for grazing. This estimate has been arrived at by excluding all areas over the 1,500 feet contour (as such areas are seldom if ever visited by cattle) and areas closed annually to grazing for silvicultural reasons for the protection of bison.

Range.	*Name of compartment.*	*Actual area.*	*Area closed annually.*	*Area inaccessible.*	*Area available for grazing.*
		ACS.	ACS.	ACS.	ACS.
Srivilliputhur	Ayyanarkoil	8,128	924	2,797	4,407
	Valaikulam	1,530	470	..	1,060
	Mamsapuram	3,000	448	1,299	4,397
	Rangarkoil	3,144			
	Rangathirthum ..	3,253	..	99	3,154
	Pudupatti	5,535	630	1,860	3,045
	Khansapuram ..	2,396	..	..	2,396
	Chittar	5,886	..	5,288	498
	Total ..	32,872	2,472	11,343	19,057
Kuttalam	Kuttalam (West) ..	1,691	775	326	1,632
	Kuttalam (East) ..	1,234		192	
	Mathalamparai	1,681	..	672	1,009
	Pumbli	506	473	134	624
	Vadagarai	815		90	
	Chinnakadu ..	1,389	..	877	1,318
	Palayar	1,852		1,046	
	Krishnapuram	3,207	342	2,017	848
	Puliangudi	2,705	669	51	1,985
	Karuppuswamikoil ..	2,953	677	672	1,604
	Vasudevanallur ..	2,957	769	844	1,344
	Puliangudi Hill	3,346	..	3,160	186
	Vasudevanallur Hill ..	4,635	..	4,552	83
	Total ..	28,971	3,705	14,633	10,633
Ambasamudram	Koilteri	2,375	542	75	1,758
	Aladiyur	3,000	..	90	2,910
	Vikramasingampuram ..	2,998	312	20	2,666
	Ambur	2,800	418	..	2,382
	Sivaisalem	3,000	..	758	2,242
	Kadayam	2,000	..	683	1,317
	Govindaperi	3,200	..	666	2,534
	Padarmalai	3,993	..	180	3,813
	Total ..	23,366	1,272	2,472	19,622
Nanguneri	Kolunthumamalai ..	2,781	341	76	2,364
	Vadagarai	12,500	3,487	5,917	3,096
	Kalakad	7,590	932	3,664	2,994
	Malayadipudur	5,000	186	2,797	2,017
	Parivarisurian	7,975	2,641	3,770	1,564
	Nambikoil	3,560	..	2,769	791
	Mudalurappan	5,260	..	5,209	51
	Total ..	44,666	7,587	24,202	12,877

Range.	Name of compartment.	Actual area.	Area closed annually.	Area inaccessible.	Area available for grazing.
		ACS.	ACS.	ACS.	ACS.
Srivaikuntam	Vallanad	2,150	498	..	1,652
	Manakkarai	2,937	..	..	2,937
	Total ..	5,087	498	..	4,589

75. *Grazing incidence.*—The total effective grazing area in each range, and the average incidence for each range as calculated from the average grazing revenue for the decennium 1936–37 to 1946–47 are given below :—

Range.	Effective grazing.	Average annual grazing revenue.	Incidence in acres per cow-unit.
		RS.	
Srivilliputhur	19,057	2,860	3·00
Kuttalam	10,633	2,430	2·27
Ambasamudram	19,622	1,425	6·89
Nanguneri	17,466	1,480	4·05

The effect of the closure of grazing compartments owing to fire has not been considered in the above statement. This would further increase the incidence. It will be noticed that the incidence varies from 2·27 to 6·89 acres per cow-unit, the average for the division being 4·05 acres per cow-unit, which is undoubtedly high from the point of view of conservation and the development of the fuel and small timber resources of the division. The Forest Officer, interested as he is in these two objects, should view that decline in the grazing revenue with perfect equanimity provided it is not due to slackness or venality on the part of subordinates ; a reduction in the grazing incidence would considerably enhance the future value, both direct and indirect of the forests, and ultimately be of great benefit to the ryot. The raising of the grazing fees would result in such a reduction in a much shorter time, but is not advocated, as it would contribute towards increasing the prevailing agrarian distress, besides being opposed to the declared policy of Government. The distribution of the incidence more evenly over the effective grazing area is however desirable, and to attain this object, penning, under suitable safeguards against fire, in such of the hill grazing compartments as are in demand, will be prescribed.

76. *Improvement of fodder grass.*—The important question of improving the fodder grass in the division has not received the attention it deserves. This is partly due to the fact that most of the more easily accessible forest on the outer slopes has been constituted into fuel felling series, and it is the policy of the department that areas set apart for the production of fuel or timber should not be utilized for the artificial propagation of grass. Four hundred and twenty acres of forest near Mundanthorai have been leased to Sri S. R. Subramania Pillay. It would be advisable for the District Forest Officer to experiment with various fodder grasses in close co-operation with the lessee. Results thus obtained would be of immense value in making improvements in the areas open to grazing.

Minor forest produce collected during 1936–37 *to* 1945–46 *Tirunelveli Forest Division.*

1. Paragraphr 79 of Chapte III of Part I.

English or vernacular name.	Botanical name.	Portion used.	1936–37.	1937–38.	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1 Athikai	*Ficus species*	..	55	50	60	..	..	..	..	..	..	..
2 Avaram bark	*Cassia auriculata*	Bark	145	189	95	..	..	..	500	600	68	902
3 Bees-wax and honey	....	..	35	36	36	..	..	..	57	76	83	32
4 Bark	....	..	..	..	..	..	..	..	840	262	1,386	456
5 Cardamoms	*Elettaria cardamomum*	Fruit	..	..	..	27	26	13	44	32	3	1
6 Cashewnuts	*Anacardium occidenale*	Do.	..	..	..	..	..	..	25	5	16	..
7 Creepers	....	..	5,000	6,000	6,550	..	..	..	2,213	454	2,314	1,896
8 Elandakai	*Zizyphus jujuba*	Do.	..	..	..	..	..	..	..	..	30	..
9 Garudakodi	....	Do.	..	..	..	..	..	..	..	..	.. 46	..
10 Ginger	*Gingiber cassummunar*	Tuber	..	..	..	..	..	..	3,066	1,500	7,192	85
11 Grass (thatch)	....	..	16,500	17,400	16,640	..	..	..	40,027	53,897	90,008	67,520
12 Grass (fodder)	....		8,180	9,601	6,757	..	..	..	7,988	18,204	76,070	10,210
13 Indukodi	*Acacia intsia*	Bark	..	..	..	..	..	..	166	..	278	..
14 Indunar	*Acacia intsfa*	Fibre	..	..	..	..	..	..	..	..	..	2,998
15 Itakalli	*Ochlandra sp.*	Seed	950	900	995	..	..	..	18,845	10,836	91,207	12,556
16 Jack	*Artocarpus integrifolia*	Fruit	..	..	..	..	..	..	316	298	144	6
17 Kadukkai	*Terminalia chebula*	Do.	..	..	..	..	..	..	2,804	4,918	12,994	452
18 Kanakamugu	*Pinanga dickonsii*	Fruit and leaves.	..	..	..	..	..	..	..	154	..	..
19 Kandapanai	*Bentinckia Coddapana*	Fruit	..	..	..	..	..	..	166	12	10,726	26
20 Kathalai	*Agave sp.*	Fibre	..	..	..	..	..	..	..	..	26	..
21 Kattujathikai	*Myristicap sp.*	Fruit	..	..	..	..	..	..	..	..	450	..
22 Kelakai	*Carissa carandas*	Do.	..	..	..	..	..	..	1,530	..	..	150
23 Kodivaliver	*Tinospora cardifolia*	Tuber	..	..	..	..	..	..	..	..	52	31
24 Kollankoraikilangu	*Corallacarpus epigoea*	Do.	..	..	..	..	..	..	..	..	68	..
25 Koovai	*Curcuma angustifol'a*	Leaves	..	..	..	..	..	..	114	..	..	..
26 Korai grass	*Cypreus rotundus*	..	9	14	4	..	..	..	139	290	1,546	212
27 Kunthrigum	*Canarium strictum*	Dammer	..	..	..	..	..	..	669	966	1,662	1,744
28 Lavangapattai	*Cinnamomum gracile*	Leaves and bark.	..	..	..	..	..	..	..	258	602	..
29 Leaves	....	..	..	..	..	..	..	..	1,423	844	792	1,400
30 Mangoes	*Mangifera indica*	Fruit	..	..	..	..	..	..	221	114	200	..
31 Nellikai	*Phyllanthus emblica*	Do.	..	..	..	..	..	..	..	..	54	..
32 Odanakodi	*Hippocrates indica*	Do.	..	..	..	..	..	..	2,470	1,688	5,626	1,435
33 Palamkodi	*Toxocarpus kleinii*	Do.	..	..	..	..	..	..	..	..	38	..
34 Panaiolai	*Borassus flabelliformis*	..	1,217	1,065	1,348	..	..	..	..	..	..	..
35 Plantain leaves	*Musa sp.*	Leaves	..	..	..	..	..	..	..	8	10	..
36 Poolathikodi	....	..	..	..	..	..	..	..	331	342	..	..
37 Pulukapattai	....	..	..	..	..	..	..	..	..	144	1,570	84
38 Rattan	*Clamus rotang*	Cane	1,618	2,082	1,154	..	..	..	2,368	3,273	284,854	9,302
39 Salaipaniodai	*Coryphaumbra culifra*	Leaves	..	..	..	..	..	..	..	76	608	..
40 Saragapattai	*Cassia fistula*	Bark	..	..	..	..	..	..	..	..	194	..
41 Sayaver	*Oldenlandia umbellata*	Chayroot	..	..	..	..	..	..	..	..	58	..
42 Seeds	....	..	..	..	..	..	..	..	462	776	82	..
43 Stone cut	....	..	559	664	455	..	..	..	..	..	..	..
44 Sundaikai	*Solanum torvum*	Fruit	..	..	..	..	..	..	..	36	10	13
45 Tamarind	*Tamarindus indica*	Do.	912	1,134	690	..	..	..	1,097	1,629	1,828	4,245
46 Screwpine flowers	....	..	482	500	464	..	..	..	..	..	..	..
47 Tellukai	*Entada scandens*	Fruit	..	..	..	..	..	..	..	..	10	..
48 Thalaipu	*Pandanus sp.*	Screwpine flower.	..	..	..	..	..	..	590	490	156	256
49 Thanikai	*Terminalia belerica*	Fruit	..	..	..	..	..	..	..	..	28	..
50 Vallikilangu	*Ipomoea digitata*	Tuber	..	..	..	..	..	..	..	..	8	..
51 Vembadam	*Ventilago madraspatana*	Bark	..	..	..	..	..	..	..	..	..	15
52 Usufructs of Palmyra	*Borassus flabelliformis*	Leaves, fruits, etc.	..	..	..	..	..	..	1,020	818	118	..

77. *The grazing year.*—The grazing year is at present synonymous with the fasli year starting from 1st July. This is because the demand for grazing begins only in July, by which time the south-west monsoon has already burst on the hills. The fallow fields and tank-beds where the village cattle normally find their grazing are no longer available, as the former are under cultivation and the latter are usually filled with water. No change in the present arrangement is advocated, as it is not only long established in the division, but also is eminently suited to local conditions.

78. *Closure to grazing.*—The present policy is to close areas to grazing after bad fires mainly to enable the damaged tree growth to recover by removing the temptation to the grazier to return the area. There is little doubt that the majority of the fires in grazing areas are due to the incendiary activities of graziers who attempt to destroy the tall coarse grass present in such areas by fire, in order to obtain the luscious young shoots which appear in the burnt area immediately after a little rainfall. To be of value silviculturally and also as a deterrent measure, closure should be prompt and effectively enforced. Cattle do appreciable damage to fire burnt coppice and seedling growth; besides they loosen the exposed soil by trampling and thus render it more liable to erosion by rain, a matter of considerable importance in this division where the bulk of the forests are situated on steep slopes. At present much delay is caused before closure can be applied as the Collector's sanction is necessary. The delay is fatal both silviculturally and as a deterrent measure. The only way to remedy this state of affairs is to empower the District Forest Officer to order closure himself up to 1,000 acres subject to the proviso that any action taken by him be reported forthwith to the concerned Collector within ten days.

79. *Minor forest produce.*—All minor forest produce is extracted through the agency of contractors, the right to collect it being sold annually in auction by farms for the fasli year beginning 1st July. The following table contains an abstract of the total quantity in quarters, of various items extracted in the division, according to contractors' accounts for the decennium 1936–37 to 1945–46. The botanical name of most of the items has been verified as far as possible, but the need for verification with botanical specimens is emphasized. The conversion factor adopted is one head-load equals 56 lb.

In addition to the list of products, enumerated above, the following items which find a place in the existing schedule of minor forest produce, but which do not appear to have been collected, may be included :—

(1)	Kalmadam	*Buchanania sp.* (probably).
(2)	Nervalam	*Corton tiglium.*
(3)	Puvan seed	*Soleichera trijuga.*
(4)	Oranges, lemons and Pumiloes.	Found in Rest-house compounds.
(5)	Guavas	Found in Rest-house compounds.
(6)	Punnamkottai	*Calophyllum inophyllum* seeds.
(7)	Seenthi kodi	*Acacia pennata.*
(8)	Kalpasi	*Stone-moss.*
(9)	Vilvamkai	*Aegle marmelos.*
(10)	Kullaipattai	*Grewia sp.* bark.

The inclusion of the shed horns of sambhur and cheetal stags, at present an item in the schedule, is not advocated as the collectors frequently set fire to grass areas in order to find the horns more easily. In this division where game is comparatively scarce, the revenue sacrificed will not be incommensurate with the risk to the forest involved.

The prevailing system of dividing the ranges into farms bounded by natural features has much to recommend it, as small contractors are encouraged to bid at the sales and competition is stimulated. The prices obtained at the sales are usually fair as competition is keen and the system of sales long established. Therefore, departmental collections not recommended save in exceptional circumstances, e.g., where prices obtained at the sales for a particular product which can be easily collected, such as tamarind, are wholly incommensurate with the value of the produce as judged by previous year's prices and the current year's expectation of the crop.

Section 2.—Markets.

80. *Fuel and small timber.*—All the fuel and small timber produced in the Nanguneri and Ambasamudram ranges is disposed of locally, the small timber being absorbed mainly by the rural and village population and the better fuel being sent to the big towns such as Tirunelveli and Palayamkottai. The abolition of tolls on cart traffic has given a great impetus to this method of fuel transport which is now cheaper for distances below 30 miles.

than rail traffic. About 25 per cent of the fuel, charcoal and small timber produced in the Kuttalam and Srivilliputhur Ranges is sent to Madurai for sale, the difference between the sale prices at this town and those prevailing locally more than covering the additional cost of transport.

81. *Evergreen timber.*—The big timber produced in the division is all evergreen timber. The difficulty of the terrain, the comparatively low value of this timber, the need for light extraction in order to preserve the essential character of these forests, have all contributed towards rendering expenditure on metalled roads unjustifiable. It is not possible therefore to extract logs, and only scantlings, such as boles 16 feet by 6 inches by 4 inches and half boles, kais 18 inches by 5 inches by 2 inches and half kais, and similar sizes, can be extracted, the timber being manhandled from stump site to road head, and adistance which may be anything up to 2 miles.

82. *Sandal.*—All the sandal produced in the division is sent annually to the Tiruppattur Sale Depot for sale. The need for meeting the local demand by establishing sale depots at all Range Offices and District Forest Office at Tirunelveli is emphasized.

83. *Minor forest produce.*—The minor forest produce collected in the division is all absorbed locally, none of it as far as enquiries go, being exported.

84. *General.*—It will be noted that the division is at present far from self-supporting as far as the demand for forest produce is concerned. Prices are controlled by outside agencies, timber prices by the output of the Travancore State Forests and the imports at Tuticorin ; fuel prices more or less, by the area exploited annually by the various zamindaries and temple lands, scattered over the division. The zamindaries are particularly capricious in their annual yields, as felling is regulated not on the principle of a sustained yield but according to the present needs of each zamindar.

85. *Markets.*—The chief local markets for forest produce are—

Nanguneri Range—
- Tirunelveli.
- Palayamcottai.
- Srivaikuntam.
- Tiruchendur.
- Tuticorin.
- Shermadevi
- Nanguneri and
- Kalakad.

Ambasamudram Range—
- Ambasamudram.
- Kallidaikurichi.

Kuttalam Range—
- Tenkasi.
- Kadayanallur.
- Vasudevanallur.
- Sankarankoil.

Srivilliputhur Range—
- Srivilliputhur.
- Rajapalayam.
- Watrap.
- Sattur.

The only foreign market is Madurai, which absorbs about 25 per cent of the outturn of fuel and small timber of the coupes in Kuttalam and Srivilliputhur Ranges.

SECTION 3.—LINES OF EXPORT.

86. *General.*—Both the Tirunelveli and Ramanathapuram districts are supplied with an excellent net-work of roads maintained by the respective district, taluk board and municipal authorities. Most of the roads in Tirunelveli district are so well maintained, as compared with those in the Ramanathapuram district, that the motorist knows without being told that he has crossed the Tirunelveli-Ramanathapuram frontier. This road system is reinforced by the following metre gauge railway lines of the South Indian Railway :—

(1) The Virudunagar-Tenkasi chord line, connecting the forests of Srivilliputhur and Kuttalam, with the big towns of the North Tirunelveli and Ramanathapuram plain and with Madurai.

(2) The Tuticorin-Maniyachi branch line connecting with the port of Tuticorin.

(3) The Tirunelveli-Tiruchendur branch line.

(4) The Tirunelveli-Virudunagar line.

(5) The Tirunelveli-Ambasamudram-Tenkasi line ; available for the forests of Ambasamudram and Nanguneri Ranges.

87. *Forest roads.*—Forest produce is usually transported from the forest along rough fair weather cart-tracks, to the main public roads and thence either by road or rail to the

important markets. The only metalled forest roads in the divison are the Papanasam-Upper Dam ghat road 8 miles, and the road connecting Kalakad village with Sivanaperi rest-house, about half mile. The first mentioned road to the Upper Dam beyond Mundanthorai is maintained by the Hydro-Electric Department and is kept in very good condition. The Forest Department pays half the maintenance charges. Since most of the fuel series are in their second rotation, and some in their third, expenditure on cart-tracks in a fuel coupe is restricted to the re-opening of such tracks as were used in the previous rotation. This comparatively small expenditure is cheerfully borne by the coupe contractor, who, it must be acknowledged, does the work far more cheaply and expeditiously than it could be done departmentally. Too little attention, however, has been paid in recent years to the important point of assisting the contractor to bring his produce out of the forest. The excuse has been retrenchment, but it is no real economy, rather the reverse indeed, to allow our roads to get into disrepair, as not only will the subsequent cost of repairs be greatly increased, but the prices paid for forest produce will be correspondingly reduced. It also frequently happens that forest produce has to be conveyed from a particular coupe where the only road available belongs to a pattadar. The latter is usually reasonable, and some amicable settlement between the pattadar and contractor can be arrived at to the benefit of both parties. The pattadar however is sometimes unreasonable in his demands with the result that the contractor suffers loss and becomes increasingly reluctant to purchase such coupes. It is therefore to our benefit to arrange the details of extraction from every coupe, well in advance of the sales and also to inform intending bidders at the time of sales what arrangements have been made to facilitate extraction. The acquisition of every such cart-track under the Land Acquiaition Act is not advocated, as some roads are useful only for one or two coupes and are therefore likely to be used only once or twice in thirty-year rotation. The cost of acquisition would thus be wholly incommensurate with their value to us. Such roads as are likely to be of benefit for the working of a series of coupes however should be acquired, if other methods of bringing the pattadar to reason fail.

Since the writing of Mr. Lasrado's plan the Serviar has been bridged and the original Kariar crossing is submerged by the Hope Lake which can be crossed by boat or by the road which runs around the lake.

88. *Inspection paths in the shola forests.*—The need for opening up the evergreen shola areas at Kannikatty and Kodamadi was recognized in 1929, when a scheme for supplying the wardevastated areas in France with cheap timber was being organized by Mr. A. W. Lushington. About 75 miles of inspection paths (45 miles in Kodamadi and 30 miles in Kannikatty), were constructed at a cost of Rs. 1,118–9–0 in order to assisting the preparation of rough stock maps of an area of about 75 square miles. As the scheme was given up, these paths were mostly abandoned with the result that many of them were obliterated either by all-pervading reed jungle or by evergreen growth. Such of the paths as lead to the various rest-houses in these areas are being maintained, while others used frequently by elephants, provide at present the only means by which the interior of the forests can be inspected.

SECTION 4.—METHODS OF EXPLOITATION AND THEIR COSTS.

89. *Fuel and small timber.*—All fuel and small timber is extracted through the agency of contractors. The method of working and the rates vary from place to place, according to tradition, availability of labour and the demand for the produce. The following methods are in vogue :—

(*a*) On the receipt of the licence the contractor first proceeds to clear all undergrowth, and fell and coppice all tree growth except reserved trees flush with the ground. This work is all done on contract by one set of axemen at about Re. 1 per ton. Another gang of axemen converts all the fuel into billets and loads the latter into carts (where carting is possible). These are paid at the rate of Re. 1 per cart-load, but this figure is increased to a maximum of Rs. 1–8–0 per cart-load according to the land. All the small timber is rough dressed into poles *in situ* and loaded into carts by a third set of coolies who are paid at the rate of Rs. 3 per cart-load. Big timber, if any, is rough squared and loaded into carts at a rate of Rs. 8 per cart-load of about 20 cubic feet. In case carting is not possible the produce already felled is converted into charcoal by professional burners, who are paid at the rate of 12 annas per bag of 80–85 lb. This system is prevalent in most of the four series in Kuttalam and Srivilliputhur Ranges.

(*b*) The preliminary work is the same but payment for conversion is different. In the Parivarisurian and similar poor fuel coupes of Nanguneri Range, the fuel is felled, converted and loaded into carts at a rate of Rs. 2 per 100 thulams which works out at Rs. 3–2–0 per ton. Another rate paid for similar work in the better fuel series like Kalakad and Tirukurangudi is 10 annas 8 pies per " Thak " of about 43 stacked cubic feet ($3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet), which on the assumption that 1 ton equals 128 stacked cubic feet, amounts to about Rs. 2 per ton. The rate for charcoal is 1 anna 2 pies per 8 thulams which amounts to 9 annas per bag of 80–85 lb.

(c) In Ambasamudram Range the felling, trimming of stools, billeting and stacking in heaps, are all done in one operation, the rate varying from 4 annas to 6 annas per idai of $\frac{1}{8}$ ton.

90. *Method of working.*—The method of extraction in the "simple coppice" coupes is that prevalent throughout the Presidency. The annual coupe is surveyed and demarcated on the ground in accordance with the working plan map and is divided according to its size into three or more strips. On receipt of his licence, the contractor is permitted to start felling in strip I, and on completion of this strip he is allowed to commence work in strip II provided he has paid all his dues under the terms of the contract and the Range Officer has given him a clean bill for the first strip. All removals from the coupe are covered by head-load or cart-load permits issued by the contractor or his authorized agent, and monthly return of all permits issued is sent by the contractor to the Range Officer.

91. *Removals of fuel by head-loads.*—All brushwood and such fuel of small dimensions as would be unremunerative to cart is sold by the contractor on head-load permits. The number of head-load permits sold annually in the division for the triennium 1930 to 1932 is given below :—

Year.	Name of Range.				
	Srivilliputhur.	*Nanguneri.*	*Ambasamudram.*	*Kuttalam.*	*Total.*
1930	32,960	29,091	41,290	65,326	168,667
1931	31,716	26,536	33,175	69,648	161,075
1932	41,484	33,547	34,061	75,710	184,802

The fuel is collected thus mostly by women both for household use and for sale in neighbouring villages, and the trade forms a valuable means of supplementing agricultural income especially in the off-agricultural season. It will be observed that on an average 171,515 people visit the fuel coupes annually ; it is not surprising that utilization of the produce is very complete, there being, besides thorns, little or nothing left in the coupe which would be useful for burning prior to artificial regeneration. With a view to assist regeneration operations and also to control removals from the coupes, it has been suggested that the contractor should be compelled to retain all brushwood below a minimum girth of 3 inches in the coupe, and to stack small fuel above 3 inches girth in the coupe, so that such stacks could be measured departmentally and the contractor compelled to issue only as many head-load tickets as would cover the produce in his coupe. At present head-load tickets are issued by the contractor as a matter of routine and there is a suspicion that removals are affected not only from the coupe but also from other parts of the forest. The remedy advanced above would improve matters and help regeneration operations, but it is open to serious objections. Firstly, a large number of people who rely on this trade for their livelihood would be adversely affected and illicit removals would probably be considerably aggravated. Secondly, the imposition of a girth limit on removals is bound to serve as a powerful handle in the hands of unscrupulous subordinates for petty oppression and corruption. Thirdly, the compulsion on the contractor to stack his brushwood before sale would mean an increse in extraction costs which would undoubtedly affect our sale prices adversely. Fourthly, the difficulty of enforcing a girth limit on removals, on an illiterate populace should be considered. Fifthly, it is the fuel below 4 inches girth which is most valuable to the palmyra sap boiling industry. Finally the ryot has learnt by long usage to go to the fuel coupes for his requirements and this is borne out by the frequently observed fact that where a fuel coupe is reasonable close to a village, illicit removals in the surrounding forest are rare. For these reasons the abovementioned restriction on such removals is not advocated.

92. *Timber.*—Evergreen shola timber is the only timber extracted in the division. Situated as the shola forests are, comparatively remote from human habitations, in localities which besides having a high rainfall and being infested with millions of leeches, are frequently malarious, it is only to be expected that exploitation is both difficult and expensive. Mr. Lasrado marked 20 coupes in the evergreen forests of the division to meet local demand for timber. During the war years all the coupes were fully worked and accessible areas outside these coupes were also exploited for defence purposes with little regard for silvicultural principles.

93. *Method of working.*—All the trees in the coupes marked by Mr. Lasrado were sold standing to contractors after they were marked by the Range Officer in accordance with the rules prescribed. When however the requirements for defence had to be met these rules were practically ignored and everythiug useful was removed not only in the marked coupes but in almost accessible areas outside the coupe limit. We are, therefore, now left with very little unexploited accessible evergreen areas.

94. *System of sale.*—Although the coupes marked in the last working plan were exploited by selling marked standing trees the defence fellings carried out departmentally were done indiscriminately.

95. *Sandal.*—All sandal is now extracted under the prevailing Sandalwood Extraction Rules and is sent after final cleaning to Tirupattur depot, East Vellore Division, for classification and sale.

Section 5.—Past and Current Prices.

96. *Fuel coupes.*—Practically all exploitation in the division consists in selling the standing crop in the forest to contractors in public auction; departmental working of fuel coupes in the past proved much less profitable and a change in the system of working is not advocated. The prices paid by contractors for the fuel coupes have varied in the recent past on account of the war and the subsequent dislocation of pre-war standards so that no available data can be used for purposes of future management. Prices rose from Rs. 11 to Rs. 70 mentioned by Mr. Lasrado to as much as from Rs. 100 to Rs. 700 per acre, and it would be idle speculation to comment on the prospects in the future.

97. *Evergreen timber.*—The following table gives details of prices obtained for standing trees in the evergreen timber coupes sold to contractors during 1932 and 1933. For purposes of comparison the nett average profit per tree under departmental working from 1929 to 1945 is also included.

TABLE.

Year of working.	*Locality.*	*Number of trees.*	*Nett revenue obtained.* RS.	A.	P.	*Average revenue per tree.* RS.	A.	P.
1929–31	Kannikatty	311	3,954	0	0	12	11	5
1932	Do.	151	800	0	0	5	4	9
	Kodamadi	159	1,300	0	0	8	2	10
	Sengalteri	100	725	0	0	7	4	0
1933	Kannikatty	138	862	8	0	6	4	0
1934–35	Kodamadi	401	..			11	0	0
1935–36	Do.	403	..			7	2	0
1936–37	Sengalteri	170	..			5	2	0
1937–38	Kannikatty	270	..			11	0	0
1938–39	Sengalteri	120	..			8	4	0
1939–40	Kannikatty	303	..			10	4	0
1940–41	Sengalteri	52	..			7	3	0
	Kannikatty	323	..			13	15	0
	Sengalteri	62	..			7	9	0
1941–42	Do.	56	..			6	0	0
1942–43	Kannikatty	215	..			38	0	0
	Sengalteri	62	..			7	4	0
1943–44	Kodamadi	181	..			74	0	0
	Chittar series	53	..			90	0	0
1944–45	Kodamadi	98	..			183	0	0
	Chittar series	52	..			201	0	0

CHAPTER IV—STAFF AND LABOUR SUPPLY.

Section 1.—Staff.

98. *Present staff.*—The District Forest Office and Range establishments as they stand at present are shown in the following statement :—

Name of establishment.	*Gazetted Officers.*	*Rangers.*	*Foresters.*	*Forest Guards.*	*Reserve watchers.*	*Clerks.*	*Peons.*	*Bungalow watcher.*
District Forest Office.	1	..	..	..	..	9	4	..
Srivilliputhur Range.	..	1	2	10	10	1	1	..
Kuttalam Range ..	..	1	2	13	13	1	1	..
Ambasamudram Range.	..	1	3	11	11	2	1	1
Nanguneri Range ..	..	1	3	17	17	2	1	1
Total ..	1	4	10	51	51	15	8	2

99. *Rangers.*—Kannikatty and Kodamadi Ranges were amalgamated into one as Ambasamudram Range with effect from 1st April 1934 with headquarters at Ambasamudram.

Srivaikuntam Range was amalgamated with Nanguneri Range as prescribed in paragraph 552 of Mr. Lasrado's working plan, the headquarters of the Nanguneri Range Officer being Sivanaperi (Kalakad). As it is, Vallanad Reserved Forest and Teri Reserved Forest are too far away and the protection of these reserves cannot be adequately supervised by the Range Officer, Nanguneri, and this may probably be also the reason for the failure of the

fuel plantation in Teri prescribed by Mr. Lasrado. It would now seem advisable to reconstitute the old Srivaikuntam Range as it has been decided to afforest the sand dunes of about 11,000 acres of Teri Reserved Forest with Prosopis and cashew. Large areas of about 1,000 acres will have to be taken up annually for regeneration and this would necessitate the immediate and personal supervision of a Ranger at Srivaikuntam. The policy of Government taking over of panchayat forests when given effect to, would add areas to this new range.

No change is proposed in the other two ranges Kuttalam and Srivilliputhur.

100. *Foresters.*—The sanctioned strength of foresters for all the ranges as they stand at present is adequate. By the reopening of Srivaikuntam Range one more Forester with headquarters at Vallanad would be employed. The Forester at Nazareth will have enough of work there in afforesting Teri Reserved Forest.

101. *Forest guards.*—The existing distribution of beats in each range is as follows :—

Serial number and name of beat.	*Headquarters.*	*Approximate distance of outter boundary.* M.	F.	*Remarks.*
	Srivilliputhur Range.			
1 Khansapuram	Khansapuram	11	0	....
2 Pudupatti	Pudupatti	8	0	Government quarters.
3 Kunnur	Kunnur	5	4	....
4 Rengathirtham	Srivilliputhur	6	4	....
5 Rangarkoil	Do.	6	0	....
6 Alagarkoil	Athithondu	2	4	Government quarters.
7 Valaikulam	Do.	11	0	Do.
8 Athithondu	Do.	7	0	Do.
9 Ayyanarkoil	Mudangiar	6	4	Do.
10 Rajamparai	Do.	7	0	Do.
	Kuttalam Range.			
11 Vasudevanallur	Narayanapuram	2	2	Government quarters.
12 Narayanapuram	Do.	7	4	Do.
13 Karuppasamikoil	Chellapuli	4	0	Do.
14 Puliangudi	Melapuliangudi	4	4	Do.
15 Chitamani	Do.	7	4	Do.
16 Krishnapuram	Kumanthapuram	3	4	....
17 Kadayanallur	Kadayanallur	3	6	....
18 Chinnakadu	Kasidarmam	3	4	....
19 Panpuli	Panpuli	5	0	....
20 Vallam	Vallam	2	0	....
21 Kuttalam	Kuttalam	3	0	Government quarters.
22 Aiyaraperi	Do.	3	4	Do.
23 Mathalamparai	Mathalamparai	2	4	....
	Ambasamudram Range.			
24 Kadayam	Mettur	4	0	....
25 Govindaperi	Govindaperi	4	0	....
26 Sivaisalem	Sivaisalem	5	0	Government quarters.
27 Ambur	Do.	5	0	Do.
28 Korayar	Papanasam	3	4	Do.
29 Aladiyur	Do.	8	4	Do.
30 Koilteri	Mundanthorai	Nil.		Do.
31 Padaramalai	Do.	Nil.		Do.
32 Kodamadi	Kodamadi	Nil.		Do.
33 Kariar	Upper Dam	Nil.		Do.
34 Kannikatti	Kannikatti	Nil.		Do.
	Nanguneri Range.			
35 Kolundumamalai	Sermadevi	16	0	....
36 Terku Viravanallur	Puthukudi	4	4	....
37 Padmaneri	Padmaneri	6	4	Government quartors.
38 Vadagarai	Sivanaperi	5	4	Do.
39 Kalakad	Do.	3	6	Do.
40 Sengalteri	Koovapatti	Nil.		Do.
41 Malayadipudur	Sivanaperi	6	4	Do.
42 Nambikoil	Nambiar site	4	6	Do.
43 Tirukurangudi	Do.	3	2	Do.
44 Valliyur	Tirukurangudi	5	6	....
45 Parivarisuriyan	Do.	4	6	....
46 Vallanad	Vallanad	9	6	....
47 Manakarai	Manakarai	9	6	....
48 Kachinavilai	Kachinavilai	5	6	....
49 Nazerath	Nazerath	6	4	....
50 Kanam	Kanam	5	4	....
51 Kayamoli	Kayamoli	7	4	....

It is proposed to employ two guards on special duty for plantation work at Nazerath which will make the staff 53 guards.

102. *Office establishments.*—There are at present 9 clerks in the District Forest Office including the Typist and Draftsman. With start of regular afforestation in the Teri Reserved Forest one more Clerk will be necessary for the District Forest Office to cope with the increased work involved.

103. *Permit issuing officers.*—Permit issuing officers are not employed. Permits are now being issued by the Range Officers and Foresters authorized for the purpose. This system which works satisfactorily will continue.

104. *Manure leaf revenue.*—The demand for manure leaf is largely seasonal and it is being met by removals on permits at present in accordance with orders issued in G.O. Ms. No. 2220, Development, dated 17th October 1942 (C.C.P. Mis. No. 304/42, dated 2nd November 1942). In addition the contractors of fuel coupes are permitted to sell manure leaf to the public from the coupes leased to them. It is also advisable to form manure leaf plantation and suitable areas in each range will be prescribed.

SECTION 2.—LABOUR.

105. *General.*—No difficulty is usually experienced in obtaining unskilled labour for departmental works such as, regenerations, fire line and cupe line clearing and road repairs. The demand for agricultural labour being seasonal unskilled labour is apt to be scarce at harvest or sowing time. The number of festivals celebrated annually by the ryots of the division, however, preclude the detention of labourers for any length of time away from their homes and is accordingly a source of annoyance to employers of labour.

106. *Hill Tribes.*—The only inhabitants of the ghats are the Kanis and the Palayars. The Palayars are a malodorus and unsightly race, with short bodies, square faces, thick lips and unkempt hair. Men and women wear a small cloth or palm leaf sheath about the thighs ; they scarcely even bathe and when they do, it is only (as they explain) to keep themselves cool and not clean. Their language is a corrupt form of Tamil. They live in groups of one or two families in the pudais or caves in the ghats forests, occasionally rigging up rough shelters of reed and leaves for comfort in the dry weather. Most of them collect minor forest produce, such as roots, honey and wax, cardamoms and dammar for the renters under the Forest Department and receive grain in payment which they cook and eat at once, with great avidity and improvidence. Otherwise their foods are generally taken raw. All told they now number about 30 persons in Srivilliputhur Range and about 15 in the hills overlooking the Sankaranayanarkoil taluk in Kuttalam Range. A few are utilized at present by the Srivilliputhur Ranger in Sandalwood extraction work, mainly in transport of sandalwood trees to the forest depot and in guarding the latter. They are not by nature hunters of game and are useless as trackers. They do not keep cattle or cultivate. Having exhausted the resources of a particular locality they move to another pudai. Marriages are of the flimsiest character and promiscuous relationship common. Child birth is a simple matter and is considered not to require more than two days holiday. Old and useless people are neglected and left to die. They have no headman and everyone settles his own quarrels.

107. *The Kanis.*—The Kanis are to be found in the neighbourhood of Kannikatty and in the Singampatti zamin. They are aso called Malai Arasans and are supposed to be the oldest race in the division having been driven into the hills by the first invaders of the plains. They are much more civilised than the Palayars. Their settlements, called Vadis consist of huts made of reed, grass and small timber, and are situated strategically away from the haunts of men or animals. Surrounding these dwellings are the patches of land they cultivate. The ground is first cleared of tree growth and the felled matter well burnt. After the first shower of rain it is roughly chopped up with a bill-hook, and is ready without further tillage to be sown. Cholam, tapioca, sweet potatoes, plantain and chillies are the usual crops and form their staple food. In addition each Vadi is permitted by the Abkari authorities to grow five ganja plants (*Cannabis sativa*) per head. This narcotic is smoked by men, women and children, and is largely to blame for the marked deterioration of the physique of the race. When their land shows signs of exhaustion, that is after a couple of years, they move on, if permitted to another spot and repeat the process of clearing, burning, and planting. This habit of shifting cultivation has been responsible for the destruction of the fine shola forest which at one time undoubtedly clothed the Ullar Peyar, Upper Kariar and Serviar valleys. In the early part of the century, the Forest Department decided to control their ravages by allotting them sites on the right bank of the Peyar. Most of them moved across the Tambaraparni to the Singampatti zamin or over the frontier into Travancore, when they are not subject to such severe restraint. There is at present a small settlement of eight male members on the left bank of the Kariar. These men find intermittent occupation in the Kannikatty forests in the regeneration areas of Kodamadi and Kariar and in the clearing of the common boundary line between Kattalaimalai Estate and the Government forests. They were of great use to the working plans party, their expert identification of the commoner evergreen species, as well as their

unrivalled knowledge of the forest being invaluable. Although of poor physique they make excellent forest guides and show remarkable powers of endurance. Each settlement has its hereditary headman who exacts implicit obedience and is much feared. The marriage tie is respected but divorce is permitted by mutual consent. Their language is a mixture of Tamil and Malayalam.

108. *Ponam plantations.*—Attempts have been made from time to time to divert their energy in the matter of shifting cultivation into useful channels, by giving them areas to plant up with teak in conjunction with field-crops. The Ponam teak plantation of 1912 raised thus, in the Kariar valley now submerged by the Hope Lake was a fine example of what they could do under proper control. The average costs of departmental teak plantations in this division in the past has been Rs. 40 per acre. With a view to reducing this cost considerably it seems desirable to permit the Kanis to practise Ponam cultivation in the Clear Felling Working Circle especially as they have recently professed a great desire to do so. They will have to be carefully watched, however, as Mr. P. M. Lushington, who had intimate dealings with them in the past, held the opinion that they were the laziest, most unreliable and mischievous of the jungle tribes he had come across. His condemnation of the tribe in an inspection note of 1915 is worth quoting: "That the Kani has been regular curse to the district there is not a shadow of doubt. He is the one hillman who is still allowed to practise shifting cultivation. In days gone by he has ruined by this system much of the fine shola round Kannikatty. He has taken a large slice comparable recently out of the Peyar valley and left it a waste. He has ruined Ullar valley which is now recovering from his depredation and he has denuded the Karïar valley which has, however, nearly rehabilitated itself. He is now actively engaged in destroying the fine shola forest of Singampatti zamin and Kattalaimalai estate. The effect of his destruction on the flow of water in the Tambaraparni must be immense. Wherever he has gone he has spread lantana which has been a further source of annoyance. He is a shiftless creature, who does not like to do any work. He will not uproot lantana because the grass cuts him, cannot attend the survey party in Travancore because of leeches, and always has an excuse against doing anything at all except destroying a further area of forest. We have got rid of him from the Government forest with the exception of ten families located in Kariar and I trust that we shall get rid of him permanently."

The present day Kanis, however, have been apparently chastened by adversity, as they have been found to be willing though somewhat erratic workers. With the exercise of tact and kind but firm treatment, there is little doubt that they will in time form a valuable contribution to the labour supply in the interior ghat forests. The Hukdar of Kattalaimalai estate has converted some of them to Christianity, and although they remain indifferent Christians, he has found them good labourers. Labour from the plains is less able to bear the feverishness, inclemency of the weather and the loneliness prevalent in the ghat forests, and hence cannot be retained for more than a week at a stretch. Besides, it has to be paid at higher rates than Kani labour, and is much less efficient in planting operations and work which involves the use of a bill-hook. The total ignorance of most of our evergreen species exhibited by the average plains-man is also a serious objection against his employment in regeneration and tending operations in our evergreen forests. For these reasons Mr. Lasrado considered it would be advantageous to encourage the Kani, by giving him all reasonable concessions, to settle in our forests. "They were since permitted to practise Ponam cultivation in the clear-felling working circles and the cost of our plantations was reduced to not more than Rs. 5 per acre."

109. *Unskilled labour.*—The rates paid in the recent past for unskilled labour, employed in the various ranges of the division are given in the tabular statement below :—

	Men-coolie.	Woman-coolie.	Boy-coolie.
	RS. A. P.	RS. A. P.	RS. A. P.
Srivilliputhur Range	1 8 0	0 12 0	0 8 0
Kuttalam Range	1 8 0	0 12 0	0 8 0
Ambasamudram Range	1 8 0	0 12 0	0 8 0
Nanguneri Range	1 8 0	0 12 0	0 8 0

110. *Skilled labour.*—Labour for building and carpentry and masonry works is paid on the following scales :—

	Mason, first class.	*Mason, second class.*	*Carpenter, first class.*	*Carpenter, second class.*	*Sawyer.*
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Srivilliputhur Range	2 6 0	1 14 0	2 6 0	1 14 0	2 6 0
Ambasamudram, Kuttalam and Nanguneri Ranges.	2 4 0	1 13 0	2 4 0	1 13 0	2 4 0

111. *Labour in fuel coupes.*—Exploitation of fuel coupes by contractors is carried out invariably on a piece work basis referred to in paragraph 89 above. The coppicing of the

tree stumps is beyond criticism, the Rajas, a Hindu caste, of Srivilliputhur Range particularly excelling in this work. An agent or two is usually employed by the contractor for supervising the work in the coupe, and these men probably from long experience are expert judges of the outturn of a coupe. They are paid a monthly wage varying from Rs. 30 to Rs. 45 a month. Labour is recruited for work in the coupes by the agents, and the local coupe contractor who advances large sums to *Kanganies* or recruiters of labour, practically controls the labour supply.

CHAPTER V—PAST SYSTEM OF MANAGEMENT.

SECTION 1.—GENERAL HISTORY OF THE FOREST.

(*a*) *Early History.*

112. *The Indian dynasties.*—The dawn of history found the Pandyas in possession of the greater part of the division. Native tradition as well as ancient writings and inscriptions represent the founders of the Pandayan dynasty to be three brothers, Pandyan, Cholan and Cheran, of the now extinct village of Korkai, at the mouth of the Tambraparni. Pandyan according to tradition ruled over the present Madurai, Ramanathapuram and Tirunelveli districts. Of the antiquity of the Pandyan Kingdom there is ample evidence. Megasthenes who about 302 B.C. was sent as an ambassador by Seleucos Nicator, one of the successors of Alexander the Great, to the court of Chandra Gupta, King of Pataliputra near Patna, speaks of a country called "Pandya" named after the daughter of the "Indian Hercules" Krishna. That the Pandyas occupied a high political and social position may be inferred from the fact that the Roman Emperor Augustus sent an embassy to them. The Pandyan dynasty remained, as the rulers of the division or intimately associated with its history right up to the middle of the sixteenth century A.D. when it was replaced by the Nayakkan dynasty (1559-1736). The Nayakkan rule came to an abrupt termination with the Muhammadan invasion of 1736 under Chanda Sahib.

113. *The British conquest.*—The next period in the history of the division saw a struggle between the French and the British for the mastery of the Presidency. This struggle after many viscissitudes ended in victory to the latter, who in 1781, obtained from the Nawab of the Carnatic, the management and control of the revenues of all the Carnatic provinces including Tirunelveli and Ramanathapuram on the condition that the Nawab was allowed a sixth of the revenue for his personal use. In 1790, a Board of assigned Revenues was created to administer the revenues and Mr. Benjamin Torin was appointed the first Collector of Tirunelveli. A decade of acute anxiety caused by a succession of Poligar (local chieftain) rebellions followed. Military reports of the suppression of these rebellions are replete with descriptions of the extent to which the dense jungle surrounding the forts of the Poligar Chieftain at Vasudevanallur, Sivagiri and other places in the plain country hampered military operations. The tracts in question are now quite bare of forest growth. On the 31st of July 1801, an agreement was effected with the Nawab of the Carnatic by which the exclusive administration of the Civil and Military Governments of all the territories and dependancies of the Carnatic was handed over to the East India Company in perpetuity. Mr. Lushington the first Collector of the district under the new Sovereign power, reported shortly after that the province of Tirunelveli had been brought "without the smallest disturbance under the company's authority".

It does not appear from the available information on the subject, that any steps were taken by the Indian Rulers to conserve the forest resources of the division. Cultivation was restricted to the rich river valleys, the intervening land being covered with jungle, which was infested by robber gangs who made travelling without a strong escort a risky adventure to be undertaken only under the direct necessity. The only attempt at conservation which deserves mention is the "tree-tax". Palmyras and some 38 kinds of trees, including teak, rosewood, mango, jack *Bassia latifolia*, tamarind, soapnut, and marking nut trees, enjoyed the dignity of taxation from very early times, the revenue from the plamyra tax being over a lakh of rupees and that from other trees being about Rs. 27,000 at the beginning of the Company's rule. The Government reserved the full right to the timber of these trees, only the usufruct of the tree being utilizable by the pattadar.

(*b*) *The British occupation* (1801–54).

114. *Early period.*—For years after the assumption of the district by the British the forests attracted but little attention from the Government; undoubtedly there was too much of it, and the conversion of a large part of it into cultivable land was most desirable. It appears that from the earliest times, ryots were permitted to fell and remove without permission or payment, wood for agricultural implements only, and fuel not exceeding a head-load at a time, for domestic consumption. Timber when felled was subject to a tax which in the absence of all supervision was easily evaded. The right to collect minor forest

produce and to fell trees other than "valuable" ones for small timber for house building and for fuel was framed out under the comprehensive term "hill rents" and formed a regular though insignificant item of the land revenue. In the periodical leases, however, no definition of what constituted a "valuable" tree was attempted, with the result that the renters under Government not only habitually felled valuable trees, but even claimed the sole prescriptive right to do so. This state of affairs was suppressed in 1842 when Sir H. Montgomery, the Collector, notified a list of "valuable" trees and prohibited their removal except on the receipt of permission from the Tahsildars and on payment of their value at fixed rates. In the interests of ameliorating the condition of the hill tribes who, it was considred, were being oppressed by the lessees, the "hill-rents" were discontinued from 1854 under the orders of Government, at the same time the renter's privileges of felling other than "valuable" trees for fuel and general domestic purposes was extended to all classes of the population. This general licence, in the absence of the adequate supervision, soon resulted in the rapid destruction of the plain forests and the more accessible ghat forests on the outer slopes, so that the need for conservation and for a special conservancy staff soon began to be felt.

(c) *The Jungle Conservancy Period* (1854–66).

115. *Beginnings of conservancy.*—With a view to prevent the unrestricted felling of wood and the consequent destruction of jungles, to conserve the more valuable trees from the danger of extension, and also to bring uniformity in the treatment of forest produce throughout every district in the Presidency, the Board of Revenue issued in 1860, circular No. 5497, which consisted of a simple set of rules called the Jungle Conservancy Rules. The subject-matter of the rules may be summarized as follows :—

(*a*) No timber tree exceeding 3 feet in circumference at 2 feet from ground level nor any "reserved" tree in any jungle owned by Government was to be felled except with the permission of the public officers deputed for the purpose, and in such localities and on such conditions as they determined.

(*b*) Villagers could cut fuel for domestic purposes but not for *sale* in low jungle and brushwood without taxation.

(*c*) Charcoal burners could fell only in such places as were assigned to them by competent authority, and were prohibited from felling "reserved trees". A seigniorage of one anna per basket of one piled *para* was to be charged.

(*d*) Bona fide ryots were permitted to fell such wood (required for the erection of their own houses), as did not come under clause (*a*), provided that at least 29 standards per acre were retained on the area exploited for the purpose. No reason for the magic number 29 was advanced, nor were the girth measurements or species of the standards specified.

(*e*) Wood required for agricultural implements, as well as bamboos for bona fide domestic purposes, were permitted to be removed without payment.

(*f*) No fruit tree or sapling of timber species could be felled or injured.

(*g*) The trees "reserved" for the value of their wood were—

(1) Ebony.
(2) Satinwood.
(3) Teak.
(4) Rosewood.
(5) Palmyra.
(6) Jack.
(7) *Artocarpus hirsuta.*
(8) *Terminalia belerica.*
(9) *Terminalia paniculata.*
(10) *Acacia arabica.*
(11) *Albizzia lebbek.*
(12) *Acacia catechu.*
(13) *Hardwickia binata.*

(*h*) Trees reserved for the value of their products were—

(1) *Anona squamosa.*
(2) *Psidium guava.*
(3) *Sapindus emarginatus.*
(4) *Bassia latifolia.*
(5) *Anacardium occidentale.*
(6) *Acacia concina.*
(7) *Tamarindus indicus*
(8 *Calophyllum inophyllum.*
(9) *Strychnes potatorum.*
(10) *Mallotus philippinensis.*

(*i*) On fuel and bamboos cut for *sale*, a seigniorage of 5 annas per cart-load, 1 anna per bullock-load, and 3 pies per headload was to be levied.

(*j*) On timber cut for *sale*, a seigniorage of Re. 1 per cart-load was to be paid. A *licence* and a *voucher* covered all removals from the forest.

(*k*) The collection of the revenue was to be undertaken by the village headman who was to be paid a commission amounting to 20 per cent of the revenue collected. Any misappropriation on his part was made punishable under Regulation IX of 1822.

(*l*) Cases of evasion of payment of the fees or unauthorized cutting of wood were made punishable according to the Penal Code under Fraud and Trespass.

116. *The Jungle Conservancy Fund.*—The revenue collected from these sources was allotted to the Jungle Conservancy Fund, and was to be expended in the raising of new plantations and the improvement of existing ones. The plantations were to be formed close to villages for the convenience and comfort of village communities and to guard against an eventual scarcity of wood. The Collector was given the liberty of administering the fund, subject to the submission of an annual report to the Board of Revenue in a specified form, showing the progress made and the amount collected and expended. Such were the humble beginnings of forest conservancy in the division.

117. *Defects of the system.*—The task of collecting the revenue and supervising removals soon provide too much for village establisments and a special conservancy establishment consisting of a supervisor and two peons was appointed for each taluk. The so-called '*licence and voucher*' sytem served at best only as a slight check on the extensive denudation of the tree growth which was taking place on the plains. Only the reserved trees were conserved, i.e., about a score of species out of the hundred or more which occurred in the forests. Many of the latter were capable of yielding fine timber, but being unreserved, even immature saplings must have been felled and removed, as in addition to the jungle wood licences, every ryot was allowed to cut his requirements annually without payment or restriction. The effort to form village plantations was a total failure partly from insufficiency of funds and lack of knowledge of planting methods, by chiefly from the apathy and the utter indifference of the people themselves their shortsightedness in not appreciating the advantage of an undertaking, which did not appear to them to give an immediate or individual return, being commented upon by almost every Collector of the district. Again relying for its success as the system did on the village headman, who was in receipt of an outrageous commission on the revenue collected, it is not surprising that it proved wholly ineffectual to arrest the denudation of the ghats.

118. *Plantations.*—Another denuding agency deserves comment here. Between 1795 and 1800, nutmegs, cloves and species of all kinds were imported from the Molaccas by the Company's Commercial Resident and introduced on the slopes of the hills in the neighbourhood of Kuttalam, the peculiar climate of which was thought to lend itself admirably to the cultivation of such exotics. The gardens bore fruit in 1813 and samples of the nutmegs, cloves, cinnamon and coffee were sent to Madras for the European market. The produce was so unfavourably reported upon by the English merchants, that the gardens were all sold to the public at a loss, the spice gardens alone being retained as being of "experimental" value. The expenditure on these gardens invariably exceeded the receipts. In 1843, the Collector, Mr. E. B. Thomas, with unusual horticultural zeal, set to, to prune, manure, and thoroughly overhaul the gardens with the result that they almost paid for themselves for a few years. He also introduced mangosteens, a little tea, and some cocoa trees. He made up some of the cocoa and gave it to some of his friends at Palamcottah, whereas he somewhat cryptically reported "it was drunk without observation." In 1853, all the gardens (with the exception of the one over Pappuli which was handed over to Travancore) were sold for Rs. 9,841 thus saving the Government an expenditure of Rs. 3,000 a year on their maintenance. The experiment, however, encouraged native enterprise, with the result that large blocks of shola forest on the Kuttalam hills such as Terkumalai estate, were assigned by Government for coffee planting. These attempts proved equally unremunerative with the result that many of them were subsequently absorbed in the reserved forest. The estates mentioned below survive to this day. They still yield a little inferior coffee, nutmegs, cloves and few mangosteens. Plaintain cultivation is being attempted in Vasudeva Estate in Kuttalam but wild boar and elephant consume or destroy a lot of the produce. Some estates are mainly worked for charcoal, for example, Kuliratte and Hope Estates, and some for timber as in Terkumalai Estate. This naturally increases the chances of illicit removals from the adjacent Government forests and frequent inspections are necessary to ensure that no Government produce is removed along with the Estate produce.

Name of estate.	Extent.
	ACS.
1 Udetam ..	11·23
2 Unjalkatti ..	9·00
3 Ramakkalteri ..	60·56
4 Terkumalai and Parathesipudai ..	615·91
5 Kuliratti ..	27·20
6 Spice garden ..	6·73
Total ..	730·63

119. *Coffee plantations.*—At about the same time, a number of small coffee estates were being laid out in the Nanguneri hills, the earliest clearing the Mahendragiri Estate (now reserved forest) having been made in about 1840. The competition of Travancore coffee, leaf disease and the unsuitability of the locality for coffee, combined to ruin the enterprise. At the time of the forest settlement in 1902, the Nanguneri hills contained 27 such estates some of which had been definitely abandoned while others had a name but no local habitation. At present, there are only two small estates in the hands of the Nanguneri Mutt near Netterikkal. In one of them, the little Mampudai Estate, a few acres have been laid out with tea, which has not taken kindly to the locality. These attempts at coffee planting in the hills were responsible for the destruction of a considerable area of shola forest. The danger thus involved to the conservation of water and irrigation dependant on mountain streams was forcibly urged in 1865 by Mr. MacGregor, then Sub-Collector of Shermadevi, and it was owing largely to his efforts that a block of 500 acres in the Kannikatty evergreens escaped narrowly from the demand of a European coffee prospector.

(*d*) *Transition Period* (1865–82).

120. *Forest reservation.*—Meanwhile, the subject of forest conservation had been taken up seriously by Government, and Captain Beddome was sent to the district in 1864 to advise the Collector generally in forest matters and to constitute the jurisdictions of the newly created " Special Department " in charge of the forests of the division. Various parts of the ghats, amounting in all to about half the forest area of the division, were claimed as private property by no less than ten zamindars. The Kalakkad forests were claimed by the Tirukurangudi Mutt and though Government overrules these pretences the mutt carried the case to the High Court. The final decision in favour of Government was made only in 1909.

The whole of the ghat forests in Nanguneri Range, and such of the Papansam forests as were not claimed by zamindars were brought under the Conservancy Rules alluded to above, and were placed in charge of a daffadar and three peons under the direct supervision of the Sub-Collector of Shermadevi. North of Kuttalam, the Vasudevanallur and Watrap forests over which no private rights were asserted, were placed under an Overseer of the newly formed " Special Department ".

121. *Defects of the system.*—The new arrangement soon proved unsatisfactory; the revenue officers had no time for forest work, and the Overseer, whose charge included the Madura forests as well, found it too big for adequate supervision. Mr. Puckle, the Collector, declared that the only remedy was to hand over the complete charge of the ghat forests to the " Special Department " and this was done in 1866, Captain Fullerton being appointed the first District Forest Officer of the combined Tinnevelly and Madura forests.

122. *Collector Mr. Puckle.*—Mr. Puckle deserves a paragraph for himself. His zeal for conservancy outran even that of the Forest Officers of the period. His statement of the sitaution in 1866 deserves to be *quoted in extenso*. He said The prosperity of the river irrigated section of Tinnevelly extending through five taluks is dependent on a continuous flow of water in the rivers that rise in the Western ghats. This continuous flow has notably decreased of recent years, and the decrease commenced with the destruction of much of the forest that formerly clothed the ghats and protected the headwaters of the streams ; the rich sholas in the ravines down which the streams descend, attracted coffee planters, who destroyed the magnificent timber and thus let in the wind which has extended the mischief done by the axe. Thousands of trees lie prostrate and the coffee gardens are mostly wind-blown and useless. Where the ground was once continuously moist, it is now parched and dry and the course of numerous little rivulets that once fed the larger streams are now rocky mullahs devoid of water. The mischief is done so far, and cannot now be repaired, but what we can do is, to conserve the remaining forest most carefully, with a view to increase the number of perennial streams. The people themselves are unanimous in their desire for conservancy as even at the foot of the hills they now begin to suffer, and lower down the streams, there is always an outcry for water." Mr. Puckle accordingly prescribed the issue of licences to cut timber ; he forbade cultivation (except coffee), and charcoal burning in the forests, and restricted grazing and the cutting of fuel by the ryots to certain limits defined separately for each village. In this respect he did not initiate a new policy as his predecessors, Messrs. Bird Eden, Montgomery and Thomas, had since 1837 prohibited dry cultivation on the slopes of the hills " as it tended to the clearing of forests which rendered to the mountains bare of trees and thereby prevented the clouds from descending on the hills during the monsoon thus resulting in scaracity of rain." While, however, his predecessors hoped to increase the rainfall by promoting conservancy, Mr. Puckle was guided in his action by more correct views regarding the effect of forests on surface drainage. Captain Beddome felt that these prohibitions endangered forest revenue and advocated a system of regulated fellings. Mr. Puckle, on the grounds that the irrigation of the district would be seriously jeopardized if Capian Beddome was allowed to have his way, appealed

to Government, who warmly supported him. In 1869, Captain Beddome revisited the division and reported that the best efforts of everyone concerned had failed to secure anything that could properly be called conservation.

123. *Private forests.*—The problem of the private forests in the division still remained unsolved. The claim most antagonistic to the new reservation policy of Government was that of the Singampatti Zamindar. The Singampatti forests commanded the upper reaches of the Tambraparni and the sources of a number of the affluents of this important river. There were several alternatives : to take the forests on lease ; to resort to litigation ; to acquire the property under the Land Acquisition Act ; or to override what was considered the doubtful claims of the zamindar by assuming the property. As a result of litigation in the High Court, the zamindar was succssful in establishing all his claims, and this decision was ultimately confirmed by the Privy Council. In spite of the best efforts of Government therefore this valuable catchment area was lost to the department.

A large area of some 8,000 acres of shola forest has been leased out by the zamindar during the last decade to the Bombay-Burma Trading Corporation for conversion into tea estates. The District Irrigation Committee has protested strongly against this alienation, on the ground of the possibly deleterious effects the destruction of shola forest in the catchment area of the Tambraparni, may have on the regular flow of water in this river. Fourtunately owing probably to the depressed state of the tea industry, only a small portion of this area has been felled and the damage done to the catchment area is not yet apparent.

The claims of the other zamindars, Chokkampatti Sivagiri, Vairavankulam and Tirumalainaicken Pudukkudi, were considered of less importance from the point of view of irrigation and hence no attempts were made either to contest or to secure control over them. The existence of these zamindaris to the present day, sandwiched as they are between tracts of Government forests, forms a great obstacle to the practical management of the forests of the division. Owing to the laxity of supervision prevalent in zamin forests, fires are of common occurrence and are a menace to the adjacent Government forests, necessitating the annual maintenance of expensive fire lines along the common boundaries. This combined with over-grazing has resulted in such a deterioration of many of the more accessible zamin forests, that the state of the adjoining Government forests forms an object lesson, even to the uninitiated eye, on the benefits of forest conservancy.

124. *The Kattalaimalai Estate.*—In the Papansam reserve, a private forest of some 4,000 acres called Kattalaimalai Estate was claimed by the Chokkampatti Zamindar. Situated as it was in the catchment area of the Tambraparni and one of its principal affluents, the Kariar, various expedients were tried to secure it, until in 1876 the project was finally abandoned. An opportunity for acquiring it by purchase in 1893 was lost, the property going to the Roman Catholic Mission in a court auction for Rs. 17,000, a trifling sum considering the importance of acquisition. It contains at present about 330 acres of coffee estates, 125 acres of which are in bearing an extensive fruit garden (limes, oranges and coconuts) which is leased out annually for Rs. 3,000 and has an income of about Rs. 1,500 per annum from the sale of fuel on cart-load permits.

125. *Reservation on the plains.*—With the progress of conservation, the demand for fuel and small timber expanded enormoulsy, and in order to relieve the pressure on the ghat forests, a scheme for the development and reservation of tree growth in the plains was taken up in 1871. The immediate object in view was to supply fuel to the South Indian Railway, the extension of which to the Tinnevelly district was then under contemplation. A start was made with five blocks of waste land near Palamcottah. The scheme of plantation failed owing principally to a lack of knowledge of the silviculture and technique of planting of the indigenous species tried. The project was, therefore, abandoned.

126. *Tank beds.*—Attention was next concentrated on the various tank-beds scattered over the division where the natural growth of *Acacia arabica, Prosopis spcigera* and *Acacia planifrons* was attempted to be fostered and extended. The revenue and forest authorities from the beginning disagreed over the management of these reserves, particularly in regard to the restriction the latter wished to enforce as to the rights of villagers to fell timber for agricultural implements, and to graze their cattle. The protection of the reserves, some 18,500 acres in extent in 1,876, was, therefore, never complete. The tank-beds were divided into five circles and placed in charge of a Sub-Assistant Conservator, Mr. Lowry, but this was found too expensive and he was soon replaced by a Forest Ranger. The reserves never paid their way as is revealed by the following figures :—

	Revenue. RS.	Expenditure. RS.
1871–1881 ..	15,534	21,511

As a result of the difference of opinion between the forest and revenue authorities referred to above, the reserves were constantly shifted about from forest management to that of "jungle conservancy" with the result, as Captain Beddome states that "cattle were allowed to graze indiscriminately and it was found impossible even to exclude goats."

The Conservator accordingly proposed in 1878 that these reserves should be transferred to the Revenue or Public Works Department directly the expenditure on them was recouped. In 1881–82, all these reserves were transferred to the Revenue Department in accordance with G.O. No. 112, dated 27th January 1882, and a sum of Rs. 1,597–11–2 being the amount spent in excess of receipts, was transferred from the Jungle Conservancy Fund to the credit of the Forest Department. During the following years these reserves which were unsurveyed but were estimated to amount to some 18,000 acres scattered throughout the division, were worked by the Tahsildar assisted by the old forest subordinate staff and the village officials. In G.O. No. 719, Revenue, dated 25th July 1887, it was ordered that as Government were of opinion, that the Forest growth on tank-beds, should not be placed at the unfettered discretion of village officials, the management of such areas should be exercised through the Forest Branch of the Collector's office "where the interest involved required a more detailed supervision than could be exercised by the ordinary revenue establishment but that the Forest Officer should not interfere where the trees on tank-beds were few in number.

127. *Revenue from tank-beds.*—Meanwhile, owing largely to the fact that the annual exploitation was considerably in excess of the annual possibility of the forest as determined on the principle of a sustained yield, the revenue from this source, that is, babul in tank-beds, had increased enormously. The figures for the period 1885–86 to 1895–96 are given below :—

Year.	From trees.	From pods.
	RS.	RS.
1885–86	5,374	2,236
1886–87	4,372	4,211
1887–88	5,945	4,577
1888–89	12,607	2,714
1889–90	5,556	4,375
1890–91	18,631	4,012
1891–92	18,092	2,354
1892–93	17,551	2,375
1893–94	19,841	99
1894–95	14,382	4,336
1895–96	2,402	6,094
Total ..	1,24,853	38,363

Thus a total revenue of Rs. 1,63,216 had been collected during a period of 11 years—an annual yield of Rs. 15,000 approximately. Under G.O. No. 260, Revenue, dated 2nd March 1885, it was ordered that all revenue derived from tank-beds after the legitimate wants of the villagers had been met, was to be credited to "Forests" and not to "Land Revenue". The claim set up by the Forest Department to the trees in tank-beds was thus indirectly recognized.

128. *Defects of the system of management.*—The dual control of the tank-beds, the direction being by the Forest Officer and the execution by the revenue establishment, proved most unsatisfactory. In 1887, Mr. Brasier, the District Forest Officer, issued the following regulations for the management of these areas :—

(*a*) The fellings should be conducted over a portion of a tank, if it was a large one, with many trees, but over the whole tank if small.

(*b*) About 25 of the *soundest* trees should be retained per acre as seed bearers such trees being marked and numbered serially.

(*c*) The other trees in the area above one foot girth at breast-height should also be counted and marked at the base so as to distinguish stumps sanctioned for sale when the trees were felled.

(*d*) The list of trees for sale and an estimate of the yield in cart-loads should be submitted with the sale list for confirmation.

(*e*) All areas felled over should be rigidly closed to grazing. (The period of closure was not specified.)

(*f*) An area was to be considered ripe for felling if the majority of the trees were over six years old.

No definite scheme was prepared on the lines suggested by Mr. Brassier and supervisors were left largely to their own devices. The attempts at excluding cattle were desultory and were soon abandoned, as the Tahsildars complained to the Collector that forest officials were interfering with the immemorial rights and privileges of the people. The rights of posterity do not appear to have been considered concurrently.

In 1896, the whole question of the management of these tank-beds was reconsidered in all its aspects. It was realized that unless they were constituted as " Reserved " forests, the forest officer would have no power to prohibit grazing when necessary. Since nearly all of them were below a square mile in extent and scattered all over the division, it seemed inadvisable from the point of view to supervision and expense, to reserve them. Mr. Hooper, Conservator of Forests, proposed that in view of the larger revenue obtained from this source, the tank-beds should be protected by the grouping of them into working circles and the preparation of simple plans for their future management. This was all the more necessary as he considered that the areas had been overfelled in the past. The responsibility imposed on the eight supervisors, one for each taluk in controlling the work of the village officials and collecting the revenue was wholly disproportionate to the salary they drew Rs. 20 per mensem. Besides the District Forest Officer, there was no one to supervise their work, and the necessity for corresponding with each of these officers direct, unnecessarily increased the office work in the District Forest Office. Mr. Hooper accordingly suggested that a special officer be deputed for the preparation of working schemes for all the tank-beds, and that their future management be vested in the Tahsildar under the control of the District Forest Officer. In Board's Proceedings Forest No. 375, dated 15th August 1896, the Board of Reveue stated that it was unable to support the proposal of reservation as it believed that " prohibition of the reservation of small scattered areas in the midst of cultivated land was specially called for in the case of tank-beds, in which free grazing was a highly valued privilege, and where excessive babul growth was injurious to the tanks as sources of irrigation." The Board while admitting that gradual degradation of tree growth was to be expected in tracts which received no greater protection than that afforded by section 26 of the Forest Act, were of opinion that babul growth on tank-beds was the one possible exception as the species was unusually hardy and conditions for reproduction from seed exceptionally favourable. As regards the hardship to the villagers that was likely to result from the loss of babul by gradual degradation, it was observed that if the supply of fuel to the railway and factories from tank-beds, was strictly limited to the *surplus* produce there would remain an ample stock from which to meet the villagers' requirements for years to come. When this was found no longer to be the case, the question of reservation was ordered to be raised again, if such a step was considered advisable.

129. *The present position.*—The management of tank-beds still remains in the hands of the reveue authorities and from the fact that the average annual revenue has sunk to a little over Rs. 1,000 it may be deducted how successful the system of management has been in conserving his important fuel resource of the plains. The District Forest Officer is still consulted, on rare occasions on professional matters, but as he never inspects the areas he has little opportunity of knowing whether his advice has been carried out. The tank-beds not being reserved forests do not come under the purview of this plan but a detailed examination of the present state of affairs with a view to remedy matters, if possible, is advocated. Fuel is a produce which cannot on the score of expense bear transport by rail for long distances, and in the interests of providing the ryot of the plains with a cheap supply of fuel, and also with the object of fostering industries relying on cheap fuel for power, such an examination would be of value. Besides with the increasing pressure of population the area under regular cultivation is bound to increase. It will therefore be found ultimately necessary to increase the productive capacity of tank-beds by raising fuel and small timber on them with a view to releasing land at present covered with sparse scrub jungle for cultivation.

(e) *The Forest Committee* (1878–82).

130. *Village forests.*—In the ghat forests the old system of allowing ryots to help themselves to small timber and fuel, and to graze their cattle in all areas under " conservancy " free of charge was still in force ; the permission of the Tahsildar was theoretically at least necessary. Illicit fellings however continued, as in the absence of any definite law on the subject, prosecutions very seldom secured convictions. In the Tenkasi taluk, Mr. Puckle when conducting the settlement, had marked off by a clearly cut ride the so-called " cairns line " of the present day, the lower slopes, which he intended should serve as " village forests." All the areas below the line was considered communal forests and open to free felling and grazing. Above the ride, free removals were prohibited, grazing excluded and fire kept out ; in fact the area was a reserved forest. The latter tract showed such a marked improvement that the change for the better was easily noticeable and was commented on even by the ryots of the division. This scheme of separation of " communal " and reserved forests received the warm support of Government, but was not extended to the other taluks of the division immediately.

131. *Permanent reservation.*—It was largely owing to Colonel Beddome's and Mr. Pennington's efforts, that conservation of a permanent character was introduced in the division. In 1878, the former reported to Government as follows : " The district had a rude example of what a flood can do, on the 18th of December 1877. I understand that the

damage to bridges, roads and tanks is not less than $1\frac{1}{2}$ lakhs of rupees, besides the damage to crops and salt. It would be a bold assertion, to say that the comparatively small felling which has already taken place, added much to the volume of the flood ; but I visited the tract to see the effects and have no hesitation in saying that, to a certain degree, its intensity must have been increased. The splendid leaf canopy of the evergreen forest is so dense that it rains for some minutes before any drops come through, and then it comes down so lightly that it is soaked up by the soft humus and debris that forms the upper stratum of the surface soil. Where the trees are felled and burnt for coffee cultivation much of this humus is burnt and the rest is swept down by the forest heavy rains ; after this whenever there is violent rain, it rushes off down the sides of the mountains forming numerous sluices where none existed before. If the rest of the Kattalaimalai estate is felled, I anticipated serious results, and if it is not too late to interfere, I believe it would be a good policy to pay a large sum to save the remainder from destruction. The Singampatti forests are threatened, and I believe, doomed, if Government don't interfere. If it, or any great portion of it is felled, it will be an act of vandalism that will be bitterly resented when it is too late and it will be impossible to say what ruin it will not bring on the Tirunelveli district." Mr. Pennington in forwarding this very excellent *expose* of the case to Government said "The report appears to me to be absolutely conclusive as to the very urgent necessity for immediate action if the magnificent irrigation system of the Tambraparni is not to be utterly destroyed. It is a matter of immediate necessity that we should secure the control of the Kattalaimalai Estate and ultimately of the Singampatti forest. I am satisfied that the delay that has occurred has already been the cause of incalculable damage and if nothing is done soon, it will not be long before the ruin of the river valley will have been completed and we shall have to write 'too late' on our forest legislation in Tirunelveli. The Board was of opinion that "if the views so strongly held by the Conservator and Collector were even approximately correct, the interests of cultivation paying a land revenue of about fifteen lakhs of rupees were most seriously endangered." It strongly urged that action should be taken for the passing of a Forest Act, so that Government could be armed with full powers to act when the necessity arose.

132. *The Forest Committee.*—In 1878, a Committee consisting of Colonel Campbell Walker, the District Forest Officer, Mr. Hayne, and the Collector Mr. Pennington was appointed to consider the important subject of reservation and to advise generally on future forest policy in the division. Their recommendations may be summarized as follows :—

(*a*) The principle first adopted by Mr. Puckle of dividing by a cleared line the forests to be reserved from those, on the outer slopes, which were to be assigned for communal purposes was accepted. The "cairns line" was accordingly extended in the ghaut forests of all the taluks.

(*b*) The whole reserved forest of the district was divided into seven blocks as follows :—

Taluk.	Number of blocks.	Area of blocks square miles.	Total forest area square miles.
Nanguneri	1	49·27	89·45
Ambasamudram	1	142·20	238·85
Tenkasi	3	28·14	53·19
Sankaranainarkoil	1	30·84	78·83
Srivilliputtur	1	36·36	98·87
Total ..		286·81	559·19

(*c*) No fresh pattas were to be granted in the ghaut forests.

(*d*) In the blocks proposed for reservation, it was recommended that if pasture was to be permitted, it should be on payment, as it was found on enquiry that no rights of grazing existed in these areas.

(*e*) Arrangements were to be made to secure the conservation of private forests at the hands of their owners.

(*f*) Small portions of the communal forests were to be closed to grazing for reproduction and improvement, and free grazing was to be permitted in the open areas under such safeguards against fire and other damage as might be decided upon by the Collector and District Forest Officer.

The proposals were accepted by Government but no further action was taken until the Madras Forest Act was passed into law in 1882.

133. *Dr. Brandis' visit.*—Dr. Brandis' visit to the division in February 1882 was a landmark in the forest history of the division. His voluminous report, in which he outlines the future forest policy to be adopted still remains a monumental work and has been the basis of many of the working plans which followed. The object of forest conservancy in the division were stated by him to be—

(*a*) The protection of the ghaut forests in order to secure the continuance of the water-supply in the various river systems upon which the irrigation, and hence the prosperity of the ryot depended.

(*b*) The maintenance of the fuel supply and the increase of fodder during seasons of such waste lands as could be set apart for forest growth.

134. *His recommendations.*—(1) With a view to securing the former object, he recommended that no more land whatsoever be alienated on the ghauts for coffee or any other cultivation. He realized the importance of encouraging the growth of coffee and other paying crops and of promoting the settlement of Europeans on the hills, but was of opinion that the benefit derived from such cultivation would be insignificant as compared with the damage that would be done, if the water-supply available for irrigation in the plain was diminished. He anticipated that the hardship involved by this prohibition would not be great as the eastern slopes of the ghauts were not well suited for coffee, too much money having already been lost on the cultivation of this product.

(2) He also recommended that the whole area above the outer line laid down by the Revenue survey as the limit of cultivable land, should be reserved under the Forest Act, as far as it was at the disposal of Government. This radical proposal had the effect of obliterating the communal forests proposed by the Forest Committee of 1878, but was defended by Dr. Brandis on the ground that although it might restrict the extension of cultivation and prevent the development of private enterprise on the outer slopes, it was infinitely more important in the interests of irrigation on the plains, that these forests should be preserved and extended. Besides it was realized that a boundary half way up hills would be difficult to select and maintain, besides increasing the difficulty of effectively conserving the inner reserves from illicit removals.

(3) As regards the requirements of the villagers adjoining the forests, he recommended that these should be met from waste lands within the Revenue survey limits and if this was not possible, free pasture and the cutting of fuel and small timber for agricultural implements should be restricted to those areas which were *outside* the blocks set apart for protection from fire, with a view to their improvement.

(4) On the subject of fire protection, Dr. Brandis was prolix. He attributed the degenerated state of the forests more to annual fires than to excessive felling. He said that the evergreen forests were being eaten into on their edges and their area reduced annually. The deciduous forests were kept in an open and stunted condition ; young seedling growth and coppice regeneration were destroyed and the soil was maintained in a hard and impoverished condition, which was detrimental to the retention of rainfall, so important a factor from the point of view of regulating the flow of rivers and streams. With the object of preventing fires he advocated that the assistance of persons who graze cattle in the reserves should be secured ; shifting cultivation carried out by the hill tribes should be regulated ; fire lines should be cleared and burnt round selected blocks of the more valuable forests ; private enclosures in the reserves should be clearly demarcated and the owners compelled to keep them clear under Chapter IV of the Forest Act.

Finally an establishment of fire watchers should be organized and recruited principally from the hill tribes residing in the forest and a portion at least of their remuneration should depend upon their success in protecting the areas assigned to them.

135. *Forest revenue.*—Timber, consisting chiefly of *Hopea parviflora*, teak *Pterocarpus marsupium Vitex altissima* and *Balanocarpus utilis* was being extracted at the time from the ghaut forests. It was felled and converted by the axe into scantlings and brought down by contractors who were paid at fixed rates per cubic foot, to the depots at Kalakad , Ambasamudram and Sankaranainarkoil.

Fuel and charcoal from the ghaut forests were removed on payment of the following rates of seigniorage :—

	Head-load.			Cart-load.		
	RS.	A.	P.	RS.	A.	P.
Junglewood	0	2	0	2	0	0
Firewood	0	0	5	0	6	0
Charcoal	0	1	6	1	8	0

Minor Forest Produce was also extracted, the produce being bought from the collectors at depots, by the department, at certain rates and sold thereafter by tender. Dr. Brandis

advocated the continuance of the prevailing system of extraction but favoured the restriction of removals to the areas which were *not* specially fire-protected. He estimated the average annual revenue from these sources to be—

	RS.
Timber	10,000
Fuel and charcoal	7,000
Minor forest produce	5,000
Total ..	22,000

Dr. Brandis expected that together with the grazing revenue and with more careful management under a wholetime officer, the revenue could be increased to Rs. 32,000.

136. *Forest expenditure.*—As against this he anticipated that the following annual outlay would be necessary :—

	RS.
Fire-protection	10,000
Rest-houses and roads	6,000
Establishment	16,000
Total ..	32,000

Adding to this the outlay on account of revenue Rs. 8,000 a year, he hoped that under good management the *deficit* would not exceed Rs. 8,000 a year. On the plain forests he anticipated a loss of Rs. 2,000 a year, making the total *deficit* of the division Rs. 10,000 a year. In justification of this gloomy forecast he quoted Mr. Puckle as having said " The Forest department in this district should not be judged entirely or chiefly by financial results. Its principal work is to preserve the sources of streams on which the prosperity of the district depends and if it succeeds in this Government should I think be satisfied."

(*f*) *The period of organization* (1882–87).

137. *Organization.*—During the five-year period 1882–86, succeeding Dr. Brandis' visit, the work of the staff consisted mainly in the organization and distribution of establishments fire-protection of selected blocks, and collection of revenue to meet the expenditure on these items of works. The present Kalakad and the Padarmalai and Koilteri felling series were the first areas to come under special protection. The whole of the extraction was still under the licence and voucher systems, which was developed by the Forest department, permit gumastas being instituted, checking stations established and additional watchmen and forest guards being employed to control and supervise removals. In 1884, Mr. Cherry issued orders that this system should be curtailed and localized, tracts being marked off for the purpose and that other areas should be placed under special protection for future working ; such specially protected areas were to be worked under selection fellings by compartments and sub-compartments, all mature and badly grown trees of all species being extracted and the natural regeneration of the better species being carefully tended. Valuation surveys of the crop on which simple working plans were to be based were also ordered to be made. The only maps available were those prepared by the Forest Committee, containing no topographical details. These were ordered to be corrected and added to by the staff. The Timber Transit Rules were also drafted and made applicable to the ghaut forests.

138. *Method of working.*—In 1886, Mr. Campbell Walker again condemned the licence and voucher system. Under it he said, " hundreds of men enter the forest daily, cut under no regulation, do infinite damage, and numerous issuing and recovering officers have to be employed to collect the fees, which they supplement by petty extractions on their own account." He urged its gradual substitution by departmental working or working through the agency of responsible contractors. In 1888, Mr. Walker reported that unrestricted entry and felling on permits had ceased and been replaced by regular fellings under departmental supervision, even persons permitted to remove headloads of dead wood being required to remove them from the annual *coupes*. This was a vast stride in the right direction and Mr. Brasier, the District Forest Officer, was highly commended for the change he had effected with the apparent acquiescence of the ryot. It is interesting to note that the first annual coupe of 30 acres felled departmentally in 1886–87 in the Kuttalam reserve resulted in a loss of Rs. 7 per acre, the " coppice with standard " system being adopted. Silviculturally the system was reported to be successful, as the one-year old coppice was over 6 feet and the ground was carpeted with seedlings. The weakness of the method, however, was that the areas selected were scattered, and hence difficult to control, and the best growth was always being felled.

139. *Evergreen timber extraction.*—In the evergreen and semi-evergreen forests of the ghauts of the Ambasamudram taluk, all hollow and evermature trees of saleable species

were being extracted under the *Jardinage* selection felling method with a view to improving the forest. About 6,000 cubic feet of *Kongu* (*Hopea* and *Balanocarpus*) was being extracted annually, the wastage in conversion by the axe being as high as 50 per cent. The unsaleable material was converted into charcoal however and this close utilization was warmly commended by Mr. Cherry on the score that it no t only cleaned up the forest but also yeilded a not insignificant revenue.

The Working Plan Era (1888–1915).

140. *General.*—The success of the departmental working of the early " coppice with standard " coupes soon encouraged contractors to come forward to undertake the whole work of extraction and sale of the produce, thus relieving the small staff of a great deal of responsibility and enabling it to concentrate its energies on the more important work of reservation and construction of roads and buildings. The system of selling the produce standing was introduced in 1889, Mr. Cherry remarking in 1892, that " coupe contractors who appear to have bid too highly for past contracts are becoming chary of taking up fresh areas." With the idea of re-establishing confidence lower prices were ordered to be accepted.

141. *The first working plan.*—From 1891, the system of working areas on the principles of sustained yield was introduced, and four years later a small working plan for 3,046 acres—the Padarmalai Working Circle—was prepared and sanctioned. The next decade saw a regular state of similar working plans covering the greater part of the workable area of the forest. The following table gives a list of such working plans :—

Serial number.	*Date of sanction.*	*Authority.*	*Name or working circle.*	*Area in acres.*	*Author.*
1	1895	B.P. No. 1107	Padarmalai	3,046	H. B. Bryant.
2	1897	B.P. No. 44	Kuttalam	1,839	Do.
3	1897	B.P. No. 44	Sivaisalem	3,154	Do.
4	1897	B.P. No. 2721	Ayyanarkoil	4,296	Do.
5	1897	B.P. No. 2721	Valaikulam	1,145	Do.
6	1897	B.P. No. 2721	Rengarkoil	2,265	Do.
7	1897	B.P. No. 378	Kalakad	3,264	Do.
8	1898	B.P. No. 55	Kadayanallur	1,670	Do.
9	1898	B.P. No. 62	Karuppasamikoil	1,847	Do.
10	1901	B.P. No. 247	Vallanad	5,087	P. M. Lushington.
11	1901	B.P. No. 250	Teri Reserve	13,840	Do.
12	1901	B.P. No. 263	Milvittan	616	Do.
13	1901	B.P. No. 336	Sattur	2,995	Do.
14	1902	B.P. No. 210	Pudupatti	1,167	Do.
15	1902	B.P. No. 211	Tirukurangudi	2,538	Do.
16	1902	B.P. No. 213	Srivilliputtur ghaut forests	38,035	Do.
17	1902	B.P. No. 276	Nanguneri	55,677	Do.
18	1902	B.P. No. 292	Ottapidaran	616	Do.
19	1902	B.P. No. 295	Vaippar	2,995	Do.
20	1902	B.P. No. 295	Tinnevelly	..	Do.
21	1903	B.P. No. 121	Koilteri	1,909	Do.
22	1903	B.P. No. 286	Terku Viravanallur	5,969	Do.
23	1903	B.P. No. 129	Srivaikuntam	..	Do.
24	1903	B.P. No. 130	Kotamadakki	1,811	Do.
25	1903	B.P. No. 53	Kalivayur	158	Do.
26	1911	B.P. No. 189	Puljangudi	3,100	H. A. Latham.
27	1916	B.P. No. 893	Vadagarai Melpidigai and Kilpidigai.	458	D. T. Barry.

N.B.—Items 13, 18, 20 and 22 apply to the babul growth in tank-beds which were unsurveyed and hence the area covered by these plans is not known.

142. *Objects of the working plan.*—The chief objects of these working plans were—

(1) To define the areas to be strictly protected with a view to the preservation of water sources.

(2) To regularize in a simple manner the exploitation of timber in the evergreen forests and the higher semi-deciduous forests.

(3) To control grazing.

(4) To arrange systematically for capital expenditure on roads and buildings with a view to the future development of the forests.

(5) To supply the neighbouring population with small timber, fuel and charcoal, on the principles of a sustained annual yield.

How these objects were *sought* to be attained will be commented upon below.

143. *Protection.*—With the object of preserving the catchments of the more important rivers and streams so-called " Working Circles " covering the higher reaches of these waterways were constituted, their boundaries being defined ; both felling and grazing

were prohibited in these areas. It was anticipated that under " complete rest " nature would reclothe these areas effectively by the gradual extension of the existing shola and semi-deciduous forest.

144. *Evergreen timber.*—The working prescribed in the more accessible and exploitable evergreen and semi-deciduous forest consisted in the division of each working circle into coupes, the usual felling cycle being six years. The possibility was fixed at a *maximum* of one tree per acre, the exploitable girth being 6 feet and over for *Vitex altissima* and $4\frac{1}{2}$ feet and over for other species. The trees were to be marked and sold standing, and payment was to be made in a lump sum for all the trees marked, and not calculated on the outturn. These prescriptions however were not carried out in accordance with the intentions of the Working Plans Officer, as although the average of one tree per acre was never exceeded for the whole coupe, the marking was far heavier in portions of the annual coupe. The girth limits prescribed also seem to have been unnecessarily low.

145. *Grazing.*—The whole area which was not closed to grazing for silvicultural reasons, namely, for the protection of water sources and to enable the natural recuperation of over-grazed areas, was divided into grazing compartments. It was customary at the time for graziers to use the lower slopes from November to May making daily excursions to the forest for the purpose, but from June to October the surplus cattle were penned in the higher grass lands as the grass on the lower slopes was too mature to be palatable. This led to the formation of the so-called " hill grazing compartments," each group of grazing compartments on the lower slopes having its alternative hill grazing compartment. Grazing prior to the introduction of working plans was paid for at two rates, for privileged and unprivileged cattle respectively. The *modus operandi* of the system was as follows :—

The karnam furnished each applicant with a certificate that he cultivated a certain acreage of land. For every five acres, the applicant was allowed to graze two bulls and one cow at half rates and for any surplus cattle he paid full rates, i.e., two annas per cow unit. The Range Officer concerned issued the permits and collected the fees. The real check on false certificates from karnams was the risk of discovery with the pains and penalties, criminal and departmental that followed. In 1891–92, the rates were raised to four annas per cow unit, and in 1896 the distinction between privileged and unprivileged cattle abandoned, the rate per cow unit being simultaneously reduced to three annas. With the object of preventing the young re-growth in fuel coupes from damage by cattle, all such coupes the growth on which was below six years old were closed to grazing.

146. *Roads and buildings.*—Although the capital expenditure on roads and buildings formed a prescription in these working plans, both the actual expenditure and the necessity for it was subject to the control of the Conservator when the estimates were submitted to him for approval.

147. *Method of working.*—As regards working in the deciduous forests the system of working varied according to circumstances. In the Ambasamudram Range departmental fellings were persevered in, the produce being sold in lots *in situ*, the smaller fuel being removed on the permit system on payment of seigniorage and the balance well heaped and burnt. In Sivaisalem the coupe was sold to a contractor. In Kuttalam departmental working was going on but the felled produce was sold to a contractor by tender. In Nanguneri the permit system alone was in use, gleaners having to cut under supervision in the year's coupes. The ideal aimed at, however, in all cases, was to substitute gradually, contract for departmental work as soon as the yield of the coupes could be accurately gauged by statistics of previous fellings, so that reliable contractors would come forward to take the coupes at a fixed price per acre and do the felling and extraction themselves under departmental supervision. It was apparently when this latter stage was reached in a particular area that a working plan was prepared, as all the plans prescribed the sale of the coupe to contractors.

148. *Silvicultural system.*—The system of management prescribed in these forests was invariably a modified " coppice with standard " system, modified because no rotation for the standards was contemplated or fixed. All the working plans were directly silent as to the reason for the adoption of this system with the result that the matter is left to conjecture.

149. *Artificial regeneration.*—None of the working plans seem to have anticipated the necessity for supplementing natural regeneration by artificial means wherever necessary. This was their most serious defect and is one of the reasons why the present fuel series are far from being stocked. Such artificial regeneration as was done, was largely due to the enthusiasm of individual District Forest Officers and will be commented upon in paragraph 189 below.

150. *Superior staff.*—The District Forest Officers of this period were—

	Name of Officer.	From	To
1	Mr. Hayne	1878.	1884.
2	,, Brasier	1884.	1891.
3	,, Thornton	April 1891.	May 1895.
4	,, Moss	June 1895.	September 1895.
5	,, H. B. Bryant	October 1895.	1899.
6	,, P. M. Lushington	1899.	1st April 1903.
7	,, R. D. Richmond	1st April 1903	15th May 1905.
8	,, H. O'neil	16th May 1905.	15th August 1905.
9	,, R. D. Richmond	16th August 1905.	17th March 1906.
10	,, H. O'neil	18th March 1906.	19th March 1906.
11	,, D. T. Bary	20th March 1906.	21st March 1907.
12	,, R. D. Richmond	22nd March 1907.	3rd January 1908.
13	,, H. A. Latham	4th April 1908.	24th March 1910.
14	The Treasury Deputy Collector ..	25th March 1910.	28th March 1910.
15	Mr. A. B. Myers	29th March 1910.	28th April 1910.
16	,, H. A. Latham	29th April 1910.	1st January 1912.
17	,, D. N. Strathie, I.C.S.	2nd January 1912.	11th January 1912.
18	,, A. B. Myers	12th January 1912.	21st January 1912.
19	,, T. P. Peake	22nd January 1912.	16th September 1915.

151. *Revision of working plans.*—In 1915 and the years following many of the old working plans were due for revision, and new working plans for hitherto unworked areas had to be prepared. The appointment of a Working Plan Officer was contemplated as early as 1915, but owing to the Great War and the consequent shortage of officers, no officer could be spared till 6th September 1917 when Mr. J. C. Robinson was appointed as Working Plan Officer. This officer was provided with a small staff and the work of collecting information on which to base the working plan for the whole division was proceeded with. Unfortunately Mr. Robinson was transferred on 4th February 1919 before he could complete his work and thus the labour of nearly $1\frac{1}{2}$ years had to be sacrificed, the cost of the working plan having amounted to Rs. 16,000. The work was subsequently ordered to be taken up by the District Forest Officer, but for various reasons it was shelved until 1924 when Mr. George Venugopal, the District Forest Officer, with commendable energy prepared a working plan, which, however, did not receive the sanction of the Chief Conservator as it was found defective in parts. It was however approved as a temporary scheme for three years during which time the District Forest Officer was ordered to revise it, in accordance with the Chief Conservator's orders on the subject. Nothing more seems to have been done till 1930 when a second working plan was prepared by Mr. B. J. Singh then District Forest Officer. This plan also was found defective and Mr. E. A. Lasrado was appointed on the 22nd November 1931 as Working Plan Officer to prepare a working plan for the reserves of the division, and he prepared a 10-year plan which was to expire on 31st March 1944. Mr. V. S. Krishnaswami who was appointed for the revision of the plan in 1942 could not however complete it, but wrote a short note for working the forests of this division prior to the closure of the Working Plan Division in 1944. The Chief Conservator of Forests ordered the extension of the period of Mr. Lasrado's plan till a revised plan came into existence. The working plan division for the purpose of this revision was reopened by the writer on 12th June 1947 and at the time of the revision Mr. Lasrado's plan is in force.

152. *General.*—Mr. P. M. Lushington visited the division in 1919 in order to ascertain whether the evergreen forests at Kannikatty and Kodamadi would be fit in with Mr. A. W. Lushington's scheme for supplying wood to Europe for rebuilding the areas in France and Belgium devastated by the Great European War, 1914–1918. The original idea was to supply only softwoods and the removals of these softwoods for which a sale could not be found in India had an irresistable appeal to all forest officers who had to deal with evergreen forests. The utilization and proper treatment of these forests had exercised the minds of many forest officers previously. Their comparative inaccessibility, the presence of only a few saleable species scattered over the forest among hundreds of unsaleable stems, the lack of knowledge of the silviculture most of the species, and the undoubted value of shola forest as a protection to catchment areas, all operated as powerful factors in favour of leaving these forests unworked. Opinion was veering round to the belief that the proper method of management of these forests was not merely to remove the good species but also to attempt to get rid of the useless ones. Later years showed the necessity for not only getting rid of the useless species but also keeping valuable trees, overmature though they might be, in order to foster the regeneration of the better species. In this direction Mr. D. T. Barry did excellent work over small areas at Kannikatty and Kodamadi in raising, by a modification of the shelter wood system, even aged crops of *Hopea* and *Balanocarpus*. He accomplished this by the girdling of valueless species overtopping such regeneration. Valuable

though this work was it was open to criticism on the score that it was unjustifiably expensive owing largely to the fact that the girdled trees could not be sold, and that they were liable to fall and damage useful regeneration which could not be raised agein by cutting back, owing to the facts feeble coppicing powers of most of the evergreens. Further the scale operated upon was small, and whether or not success could have been obtained with larger scale experiments was problematical.

Mr. A. W. Lushington's proposal to work these forests by making a clean sweep of existing growth and replanting with suitable species, revolutionary though it sounds, was not considered impracticable although little was known of the technique of raising plantations of evergreens at the time. Sample enumerations conducted in fairly representative forest at Kodamadi and Kannikatty gave the following astonishing results, all trees below 18 inches diameter being excluded :—

Timber yield per acre.	TONS.
Kodamadi (average type)	49
Kannikatty (average type)	76
Kannikatty (good type)	167

N.B.—The form factor was assumed to be 0·50 and 50 cubic feet was considered as equivalent to one ton.

In addition to this the small wood and branch wood outturn which could be converted into fuel or charcoal was expected to double the yield.

153. *Mr. Lushington's proposals.*—Mr. P. M. Lushington therefore advanced the following proposals :—

(1) the construction of an electric tramway of about 20 miles from Ambasamudram to Kodamadi.

(2) the erection of a saw mill and pulp mill at Kodamadi.

(3) the construction of a bridge across the Serviar at Mundanthorai wide enough to take both road and train traffic.

The electricity for power was to be obtained from the 600 feet water fall at Kuttalam Kalaruvi. Estimating the fuel demand in the division to be in the vicinity of 200,000 tons per annum he anticipated no difficulty about the marketing of the fuel obtained from the annual evergreen coupe, at the profit.

His proposals for regeneration were—

(1) On the lower slopes the introduction of teak with an evergreen undergrowth of *Hopea* in suitable places, while in others, mixture of *Hopea Balanocarpus*, *Cedrela toona*, *Vitex altissima*, *Fillicium decipiens*, and

(2) above 2,500 where the true evergreen came in *Cluts travancorica*, *Mesua ferrea*, *Dysoxylon malabaricum*, *Diospyros assimilis* and *Agalia roxburghiana* were to be introduced.

154. *Investigation of the project.*—The result of these proposals was that an investigation into the project by the newly constituted Forest Engineering Branch was ordered by the Chief Conservator in his Proceedings No. 71, dated 15th September 1920, as it was considered that the exploitation of the forests on the scale proposed was more problem for the engineer than for the forest officer. The immediate attention of the department was to be concentrated on obtaining exact information as to the extent and the yield of the forests and on ascertaining by experiments the best method of regenerating them. The desideratum was to make the forests accessible by the construction of a network of bridle paths, on a gradient which would make their ultimate conversion into cart-tracts an easy matter. In addition, rest-houses and cooly lines were to be constructed at central positions so that both labour and the staff could be comfortably housed when doing work in these inhospitable regions. It was accordingly proposed to subdivide the Ambasamudram Range into two ranges, Kannikatty and Kodamadi, and also to provide a special officer to be in charge of the development of communications in, and the stock mapping of, the evergreen sholas in the new ranges.

155. *Estimated yields.*—Mr. Lemos was accordingly appointed as Special Officer and he roughly stock mapped nearly 65 square miles of evergreen forest into the following classes :—

Type—	SQ. MLS.
A. Pure evergreen	20
B. Semi-evergreen	10
C. Deciduous	2
D. Reed area with a sprinkling of tree growth.	33

15

Types A and B alone were considered exploitable, and enumerations carried out *along some of the paths,* over an aggregate area of 228 acres, by him gave the following averages :—

	Timber per acre.	Fuel per acre.
	TONS.	TONS.
Type A—		
Kannikatty	109·06	109·06
Kodamadi	92·90	92·09
Average ..	100·57	100·57
Type B—		
Kannikatty	42·00	43·00
Kodamadi	62·22	63·22
Average ..	53·11	53·11

N.B.—In considering the volume of marketable timber an account was taken of trees below 5 feet girth; only the length of clear bole was used for height data, and a form factor of 0·5 was applied to the result to allow for taper of the stem. Fifty cubic feet was assumed to be a ton and the quantity of fuel was assumed on Empirical grounds to equal in weight the quantity of timber.

Thus the average yield in Type A forest was estimated to be 100 tons of timber and 100 tons of fuel per acre, and in Type B forest, about 50 tons of timber and 50 tons of fuel per acre.

156. *Estimated revenue and expenditure.*—The following interesting estimate of the capital value of the forest was thus arrived at :—

	Timber.	Fuel.
	TONS.	TONS.
20 square miles of Type A forests would yield	12,80,000	12,80,000
10 square miles of Type B forests would yield	3,20,000	3,20,000
Total ..	16,00,000	16,00,000

Valuing the timber at 8 annas per cubic foot or Rs. 25 per ton of 50 cubic feet and fuel at 4 annas per ton the timber stock was estimated to be worth forty million rupees and the fuel four lakhs. These estimates were shown by the more detailed enumerations undertaken during the preparation of the working plan by Mr. Lasrado to have been far too optimistic. It was not surprising, however, that the calculations outlined above led the Chief Engineer, Mr. Martin, an expert on American logging methods, to propose a large scheme to be financed on a direct development loan. The project was to consist of a railway from Ambur on the plains to Mundanthorai and ultimately to Kodamadi ; an investment in the latest logging machinery, flumes, ropeways, tractors, etc., and the erection of a saw mill at Mundanthorai. For this purpose he proposed the following capital outlay :—

	RS.
Railway plank	16,85,000
Logging machinery	2,00,000
Buildings, roads and flumes	1,00,000
Saw mill	5,00,000
Contingencies	15,000
Total	25,00,000

The annual return on investment was estimated to be—

	RS.
Fuel	60,000
Timber	4,00,000
Saw mill	2,00,000
Charcoal and by-produces	15,000
Total ..	6,15,000

or a return of about 27 per cent on the outlay. Sanguine as Mr. Martin was, however, he fortunately realized the need for the collection of more complete data and the preparation of detailed estimates based on actual surveys and enumerations, before proceeding further with the scheme.

157. *Tentative decisions.*—Meanwhile the task of opening up the forests and carrying out enumerations of the growing stock proceeded apace under the special staff sanctioned. By 1923, 75 miles of inspection paths had been constructed and 50 per cent enumerations conducted over a total area of 2,640 acres. In 1927 as a result of a joint inspection of the evergreen forests by the Chief Conservator, the Territorial Conservator and the Working Plans Conservator, the following tentative conclusions as to the best method of treatment were arrived at :—

(*a*) to make revenue by selection felling and hand sawing of railway sleepers and kolmarams (scantlings),

(*b*) to tend, especially by climber cutting, such advance growth as was present, and very gradually to open the cover by fellings which were to vary in degree from place to place according to the size and state of the advance growth present, and

(*c*) to attempt to increase the proportion of valuable species by planting where the advance growth was insufficient.

Accordingly a special officer was appointed to work under the direct orders of the District Forest Officer and under the supervision of the Working Plans and territorial Conservators. He was ordered to select an area of not more than 100 acres in the *Mesua* zone at Kannikatty and conduct light selection fellings in it, with a girth limit of 7 feet. The felled trees were to be hand sawn, the *Mesua* into sleepers and the other species into appropriate sized scantlings which could be manhandled to the nearest cart-track. Careful statistics of cost and revenue were to be kept. Climbers in the area were to be cut and advance growth of valuable species tended by giving it the requisite light. A nursery of the more valuable evergreen species was to be formed and plants from it were to be underplanted where advance growth was absent or insufficient. Direct sowing of seeds of valuable evergreen species in demarcated plots was also to be tried, the seeds for the purpose being collected from selected mother trees.

158. *Exploitation.*—In 1928 the first evergreen coupe of 61 acres at Kannikatty was worked departmentally. Some 8,000 cubic feet of timber was extracted at a total cost of Rs. 8,990 excluding overheads and a nett revenue of Rs. 440 or about Rs. 7–3–0 per acre obtained. The following table shows the results of departmental working :—

Coupe number.	*I.*	*I.*	*I.*	*II.*	*III.*
Year of working	1928	1929	1930.	1930	1931
Area worked in acres	51	..	..	45·5	30
Number of trees marked	153	..	..	108	75
Number of trees converted	132	9	9	96	67
Number of *Mesua ferrea*	35	3	6	24	32
Number of other species	97	6	3	72	35
Gross yield in cubic feet—					
(*a*) *Mesua ferrea*	3,370	241	523	1,632	2,176
(*b*) Other species	11,629	726	322	7,396	5,073
Nett yield in cubic feet—					
(*a*) *Mesua ferrea*	1,365	91	200	940	2,017
(*b*) Average outturn per tree	68	66	25	65	134
(*c*) Other species	6,633	395	74	4,690	4,684
(*d*) Average outturn per tree	39	30	33	39	63
(*e*) Average nett yield per acre for all species in cubic feet.	..	143	..	124	223
	RS.	RS.	RS.		RS.
Total cost of extraction	8,947	413	5,402	..	6,361
Total revenue	9,025	526	1,520	..	8,493
Nett prifit	78	113	2,530	..	3,132
	RS. A. P.	RS. A. P.			RS. A. P.
Nett profit per acre exploited	3 12 0	45 9 0	..	..	71 1 0
Nett profit per tree exploited	1 6 0	24 9 0	..	..	31 13 0

Exploitation in 1928 and 1929 was carried out by the Special Officer Mr. Kesava Vittal while from 1930 onwards all operations were conducted by the District staff. The great disparity in the nett revenue obtained under the different managements was partially due to the fact that in the earlier years the exploitation work had to be newly organized and hence higher rates had to be paid.

159. *Conclusions.*—The results of departmental operations showed that extraction could be undertaken at a profit which would more than cover the cost of regeneration operations. Silviculturally it demonstrated that it was not desirable to fell more than three trees on any one acre, as heavier felling made too big gaps in the canopy, which was not conducive to the preservation of the essential character of these evergreen forests. It must be added however that the coupes were carefully selected so as to include the very best areas only.

160. *Contract agency.*—The success of departmental working encouraged local contractors in 1932 to come forward and purchase standing trees in the annual coupe, but the bids, as was expected in a new enterprise like this, were disappointing. The results of working through contract agency were given below :—

Locality of working.	*Year.*	*Coupe.*	*Area in acres.*	*Number of trees marked.*	*Price obtained.* RS.	A.
Kannikatty	1932	IV	57	151	800	0
Kodamadi	1932	I	47	159	1,300	0
Sengalteri	1932	I	33	100	725	0
Kannikatty	1933	V	66	138	862	8
Kodamadi	1934	I	206	401	4,413	11
Do.	1935	II	200	403	2,871	6
Sengalteri	1936	I	70	170	871	4
Kannikatty	1936	VII	190	270	2,970	0
Sengalteri	1937	II & III	134	120	990	0
Kannikatty	1939	VIII	178	303	3,120	0
Sengalteri	1939	IV	62	52	373	12
Kannikatty	1940	IX	230	323	4,501	13
Sengalteri	1940	V	62	62	393	4
Do.	1941	VI	66	56	336	0
Kannikatty	1942	X	155	215	8,170	0
Sengalteri	1942	VI	68	62	449	8
Kodamadi	1943	IV	238	181	13,394	0
Chittar Valley	1943	I	36	53	4,770	0
Kodamadi	1944	III	222	98	17,934	0
Chittar Valley	1944	II	38	52	10,452	0
Kodamadi	1945	V	261	132	64,574 (V and VI together)	0
		VI	232	257		
Chittar Valley	1945	III	45	55	14,850	0
		IV	48	52	14,040	0
		V	33	36	9,720	0

From the prices obtained, it could be seen that there has been steady increase in rates fetched : which indicates that the working of the evergreen forests was better understood and there was real competition.

161. *Grazing.*—The need for reducing the grazing incidence by enhancing the grazing fees from 3 annas to 8 annas a cow unit in the interests of forest conservation was first felt early in 1916. The dates from which the enhanced fees came into force in the various ranges are given below :—

Name of range.	*Authority.*	*Date.*
Kuttalam	Board's Proceedings No. 148, Miscellaneous	9th May 1917.
Nanguneri	Board's Proceedings No. 242, Miscellaneous	20th June 1918.
Ambasamudram	Board's Proceedings No. 273, Miscellaneous	8th June 1919.
Srivilliputtur	Chief Conservator's Proceedings No. 221, Miscellaneous	27th July 1921.
Srivaikuntam	Government Order No. 1993, Miscellaneous, Development	30th October 1930.

But from 1st April 1939 the Government uniformly adopted a reduction of 50 per cent in the rates of grazing fees and the rates were halved and the rate now in force is only 4 annas per cow unit.

162. *Superior staff.*—The District Forest Officers of the period under review were—

Name.	*From*	*To*
Mr. D. T. Barry	17th September 1915	4th April 1917.
Mr. H. W. Woodhouse Adolphus	5th April 1917	10th May 1917.
Mr. D. T. Barry	11th May 1917	17th October 1917.
Mr. Md. Habibullah	18th October 1917	26th October 1917.
Mr. D. T. Barry	27th October 1917	10th April 1918.
Mr. G. C. Robinson	11th April 1918	4th May 1918.
Mr. D. T. Barry	5th May 1918	1st September 1918.
Mr. A. B. Jackson	2nd September 1918	7th November 1918.
Mr. D. T. Barry	8th November 1918	15th August 1919.
Mr. T. Clear	16th August 1919	21st September 1919.
Mr. S. V. Devadasan	22nd September 1919	22nd October 1919.
Mr. W. C. Hart	23rd October 1919	31st October 1920.
Mr. D. T. Barry	1st November 1920	17th May 1921.
Mr. George Venugopal	18th May 1921	28th June 1923.
Mr. A. Hanumantha Rao	29th June 1923	28th September 1923.
Mr. George Venugopal	29th September 1923	11th October 1925.
Mr. E. M. Crothers	12th October 1925	10th June 1926.
Mr. B. J. Singh	11th June 1926	15th October 1926.
Mr. J. H. Longgrig	16th October 1926	26th July 1928.
Mr. N. Trimurthi	27th July 1928	2nd April 1929.
Mr. H. G. Hicks	3rd April 1929	4th November 1929.
Mr. B. J. Singh	5th November 1929	20th May 1932.
Mr. E. A. Lasrado	21st May 1932	20th June 1932.
Mr. B. J. Singh	21st June 1932	14th July 1932.
Mr. A. A. Khan	15th July 1932	26th February 1933.
Mr. E. V. Padmanabha Pillai	27th February 1933	25th January 1934.
Mr. E. A. Lasrado	26th January 1934	2nd November 1934.
Mr. C. R. F. Williams	3rd November 1934	3rd April 1935.
Mr. E. A. Lasrado	4th April 1935	11th November 1935.

Name.	*From.*	*To.*
Mr. F. D. Ardahgh	12th November 1935	19th May 1936.
Mr. E. A. Lasrado	20th May 1936	20th November 1936.
Mr. J. H. Longgrig	21st November 1936	31st December 1936.
Mr. E. A. Lasrado	1st January 1937	14th January 1937.
Mr. H. G. Hicks	15th January 1937	21st May 1937.
Mr. E. A. Lasrado	22nd May 1937	24th December 1935.
Mr. V. G. Darrington	25th December 1937	20th September 1938.
Mr. N. S. Ghate	21st September 1938	30th January 1939.
Mr. W. C. Wrench	31st January 1939	30th April 1939.
Mr. Amir Padsha Sahib	1st May 1939	27th June 1939.
Mr. H. G. Hicks	28th June 1939	23rd March 1943.
Mr. K. T. Matthew	24th March 1943	8th April 1944.
Mr. S. Narayanaswamy	9th April 1944	8th May 1944.
Mr. K. T. Matthew	9th May 1944	19th April 1945.
Mr. U. Vridhachalam	20th April 1945	19th May 1945.
Mr. K. T. Matthew	20th May 1945	18th April 1946.
Mr. K. S. Muddanna	19th April 1946	18th May 1946.
Mr. K. T. Matthew	19th May 1946	24th June 1947.
Mr. A. V. Sundaram	24th June 1947	6th September 1948.
Mr. B. A. Cariapa	6th September 1948.	26th September 1948.
Mr. V. C. Shankaranarayana Rao	26th September 1948	....

SECTION 2.—PAST SYSTEM OF MANAGEMENT AND THEIR RESULTS.

163. *General.*—In the previous section the general outline of the history has been dealt with by periods such as procedure being found most convenient. In this section it is proposed to discuss the past treatment of the forest the reasons for it and its results.

164. (A) *Fuel Forests.—Method of treatment.*—Only the simple coppice system of management was applied to these forests.

165. *Simple coppice system.*—This system applied to all the areas.

166. *Rotation.*—It will be seen that although the rotation was originally 20 years, it became apparent at the end of the first period that this was insufficient as the crop on these dry and infertile soils was not mature enough for felling at the end of 20 years period. Fresh areas had therefore to be added to all the old felling series with a view to increasing the rotation from 25 to 30 years without at the same time decreasing the size of the annual coupe. Mr. George Venugopal's working scheme prescribed a rotation of 30 years. While the new felling series constituted under Mr. Lasrado's plan were allotted a rotation of 30 years for fuel and 40 years for Timber-*cum*-Fuel felling series. In accordance with Chief Conservator's instructions this rotation continues to be in force for the period of the revised plan also.

167. *Regeneration.*—Thirty years and more of coppice working in the division has brought coppice felling to a high state of perfection. Not even the most meticulous can find anything to cavil at in the coppicing of trees stumps as carried out in the division. During the course of inspection, however, it has been frequently noticed that felling and coppicing are often not carried out *simultaneously*. If coppicing is carried out some time after felling, a second shock to the stump is communicated and budding coppice shoots are frequently destroyed and a definite decrease in the coppicing power of the stool results. Where weed growth is fierce, it is especially desirable that the coppice shoots obtain as good a start as possible over the weeds and this can only be accomplished by coppicing the stump as soon as the tree is felled. Fortunately most of the species found in this type of forest provide excellent coppice shoots, the suppression by weeds and creepers noticed in the first few years after felling being more apparent than real. *Strobilanthes* is the one weed which is really dangerous. Being of gregarious and rapid growth it swamps newly felled areas rapidly and completely, and its dense shade is particularly destructive to natural seedlings growth of the more light demanding species such as teak. Its complete eradication from newly felled areas is therefore an urgent necessity.

Natural seedling regeneration of the more important fuel species in these areas is the exception rather than the rule. It is perhaps the case that the germinative capacity of seed from young coppice is lower than that from old trees. If so, this may account for the dearth of natural regeneration. A small experiment with *Albizzia amara* in Srivilliputtur range showed that whereas the germinative capacity of seed from 15 years old coppice was 22 per cent that from old trees outside the fuel series was 41 per cent (200 seeds of each were tried). Again in the majority of these fuel series the surface soil is so hard, the terrain so comparatively steep and the rainfall so ill distributed, that seeds does not usually germinate readily ; even if it does the seedling is either washed away by rain or fails to survive the first drought. This is the chief reason why even those of the fuel series which are in their second rotation, are far from being normally stocked. The necessity for artificial regeneration of the fuel coupes is therefore pressing.

Attempts at such work have been made in the past. Individual District Forest Officers from time to time have been impressed by the necessity for it; control journals give details as to the quantity and kinds of seed sown in various fuel coupes. Seed collection on a large scale, in all the ranges of the division appears to have been the regular practice from about 1907 to 1912 the following figures for 1910 being characteristic :—

	Name of range.				
	Srivilli-puttur.	*Kuttalam.*	*Amba-samudram.*	*Nangunery.*	*Tirunel-veli.*
Teak	807	610	240	460	..
Albizzia lebbek	232	5	39	131	273
Pterocarpus marsupium	219	112	126	358	..
Albizzia amara	40	..	..	..	..
Acacia leucophloea	50	..	..	..	..
Acacia arabica	..	..	..	14	24
Acacia planifrons	61	..	..	..	375
Zizyphus trinervia	4	..	..	..	..
Anogeissus latifolia	82	1	14	14	..
Terminalis chebula	46	..	..	..	..
Butea frondosa	134	..	..	..	..
Cassia auriculata	11	1	3	45	139
Tamarind	157	33	37	26	35
Melia azadarachia	227	34	82	79	513
Pongamia glabra	15	..	..	1	..
Acacia sundra	2	..	..	..	..
Rosewood	22	..	8	..	..
Dolbergia multiflora	22	..	..	..	135
Terminalia paniculata	..	50	..	..	..
Dolichandrone crispa	..	12	..	..	..
Chloroxylon swietenia	..	4	..	..	..
Eugenia sp.	..	4	88	47	..
Nepheluim longanum	..	3	..	..	..
Dodonea viscosa	..	5	..	..	13
Mundulea suberosa	..	2	..	..	..
Cassia fistula	..	..	2	..	..
Mahogany	..	..	5	..	..
Zizyphus jujuba	..	..	..	..	45
Odina wodier	..	..	..	..	49

N.B.—Quantities are in Madras measures.

These comparatively large quantity of seed must have been dibbled in the various fuel coupes. Information as to the mention of sowing is meagre, but a perusal of available records goes to show that the seed was dibbled in lines 10 feet apart in *blanks* over the whole annual coupe just before the monsoon. Most of the coupe numbers have been changed since and all old maps destroyed; hence the result of such dibblings cannot be assessed now with any degree of certainly. It may be concluded however, from the remarks in Mr. P. M. Lushington's inspection note of 1915 that sufficient care was not taken to keep the lines open until the plants got their heads above the undergrowth, with the result that much of the seeding growth was destroyed by suppression.

Finally the closure of fuel coupes to grazing for a period of 5 years after felling has not been found sufficient to conserve natural and artificial seedling growth owing to the slow rate of growth in these dry and infertile areas.

168. *Conclusions.*—To summarize, the simple coppice system is ideally suited to the areas to which it is applied at present, as it not only ensures the reproduction of the original forest, but also on a comparatively short rotation of 30 years, ensures the maximum sustained yield per acre which can be obtained from this type of forest. The one essential in order to obtain normal stocking, is to supplement the natural coppice regrowth where necessary by artificial means, which are likely to be cheap and efficient. Past work on these lines has not been conducted in a systematic manner. Neither the cost per acre nor the results can be accurately assessed. It is therefore necessary to devise a method which will not only be comparatively inexpensive but also be susceptible of a high degree of control.

169. *The coppice with standard system.*—This system as practised in the division owed its inception to the fact that at the time of reservation, the forests were in such a degraded state, that the first desideratum was felt to be the improvement of the growing stock. In the earliest " coupe s " therefore the felling partook more of the nature of an improvement felling, only overmature, unsound, useless and crooked trees being felled and coppiced and the bulk of the better grown trees being retained. Gradually with the increasing demand for revenue to cover expenditure, it became necessary to fell a certain percentage of the sound trees also, in order that the value of the coupe might be enhanced. As working plans came to be prepared it was found necessary to devise a name for this system of management, and its similarity to the European " coppice with standard " system resulted in the adoption of this name. The system as locally practised however differs from the true " coppice with standard " system, in that, in the former, no standard rotation is prescribed. The aggregate average annual area felled under the " coppice with standard " system in

the division amounts to 1,200 acres. "Not less than 20 nor more than 25 trees of the better species" are prescribed to be retained as standards. This means that from 24,000 to 30,000 standards are annually to be marked. The task of measuring and marking this large number of standards is often delegated to the lower subordinate and the results have in the recent past not been satisfactory. The Range Officers activities are usually restricted to checking 10 per cent of the marking.

170. *Defects of the system.*—The following table showed the present position of "coppice with standard" working in the division :—

Range.	*Name of series.*	*Area.*	*Year of starting.*	*Period of first rotation.*	*Period of second rotation.*
Srivilliputtur ..	Ayyanarkoil	5,065·0	1,896	20	32
Kuttalam	Vasudevanallur	2,961·0	1,898	20	25
	Karuppasamikoil	2,946 0	1,898	20	25
	Puliangudi	2,748·0	1,908	30	29
	Kadayanallur	1,901·0	1,898	20	26
	Panpuli	1,654·0	1,907	..	26
	Kuttalam	2,700 0	1,897	20	26
Ambasamudram ..	Padarmalai	3,929·0	1,895	20	30
	Koilteri	2,901·0	1,897	20	30
Nanguneri	Kalakad	4,353·0	1,896	18	30
	Vadagarai	2,200·0	1,918	..	30
	Tirukurangudi	1,189·0	1,902	18	27

(1) Owing to the short rotation under which the older series were worked in the past, and also probably to defective standard marking, the task of selecting the required number of standards (20—25) per acre is now sometimes impossible. The result is a very uneven distribution of standards over the felled coupe, standards being congested on good areas and very scattered on poor areas. First rotation standards are seldom, if ever, retained, presumably because it is anticipated that the revenue will suffer thereby. The following table shows the average number of standards retained over the whole "coppice with standard" annual coupe for the three years 1929 to 1941 :—

Year.	*Area of annual coupe.*	*Number of standards.*	*Average number of standards per acre.*
1929	1,176	22,022	18·7
1930	1,210	20,358	16·8
1931	1,293	22,242	17·2

It will be noted that the average is lower than the minimum of twenty standards prescribed to be retained.

(2) Standards are frequently damaged during fellings or are stolen by contractors. Many standards owing to their sudden isolation in the coupe are blown down or badly broken by wind. The contractor is compelled to pay the *value* of all wind fallen standards and in addition is fined to the extent of three to five times the *value*, according to the discretion of the District Forest Officer, for all standards illicitly removed or damaged in felling during the currency of the contract. The *value* of the standard has been fixed somewhat arbitrarily on the following scale :—

Class.	*Dimension diameter.*	*Teak and Rosewood.* RS. A. P.	*Other species.* RS. A. P.
I	Below 4 inches	0 8 0	0 2 0
II	4 inches to 8 inches	1 0 0	0 4 0
III	8 inches to 12 inches	2 0 0	0 8 0
IV	12 inches to 16 inches	4 0 0	1 0 0
V	16 inches to 20 inches	8 0 0	2 0 0

To penalise the contractor for windfalls which are due often to defective marking, would seem to be a mistake. Further the system of fining him for damaged for missing standardshas been a frequent causes of friction between the contractor and the department. That the fines so collected are by no means insignificant is clear from the following table :—

Year.	*Number of damaged.*	*Standards missing.*	*Windfallen.*	*Fines as value.* RS.	*Recovered as penalty.* RS.
1923	571	1,377	..	..	1,089
1924	1,018	1,837	477	804	510
1925	868	1,476	192	648	1,209
1926	730	1,444	567	525	1,489
1927	724	1,510	838	842	565
1928	397	1,285	349	357	1,598
1929	330	320	319	221	684
1930	205	580	378	204	535
1931	406	540	311	205	505
Total ..	5,248	10,369	3,431	3,806	8,184

The fine collected averages Rs. 1,332 per annum, the fall in the recent years being attributable to a greater laxity in the checking rather than to an improvement in working.

(3) Again the rainfall, soil and climate prevailing in most of our coppice with standard fuel series are not conductive to the development of big timber. Any one who has seen the indigenous teak will almost be inclined, at first sight to doubt whether it is the same species as that present in its natural home on the West Coast. Biologically the species are identical but the strain present in Tirunelveli is enormously inferior, girths above 4 feet and height growth above 35 feet being the exception rather than the rule. Under these circumstances the folly of trying to grow timber of large dimensions, by a proper application of the *true* coppice with standard system is patent. The local demand for the slow grown teak of the division is however undoubtedly great. Teak below 25 inches girth sells at about 4½ annas per cubic foot while between 25 inches and 40 inches girth its price is 10 annas per cubic foot. There is thus a great price increment in the value of teak once the 25 inches girth limit is passed, and the object of management should be to produce as many poles above 25 inches girth as possible.

(4) Mr. George Venugopal in his tentative working plan stated " the chief object of the standards, is to give seed ; mature trees should be retained as standards and *these need not necessarily be the best*. It has been found from past experience that straight poles of smaller dimensions are blown down by wind soon after they are exposed and straight poles of larger dimensions are often stolen during the course of the rotation so that the object for which standards are retained is defeated. If mature trees, not necessarily straight ones, are retained as standards they not only give more seed, but will remain till end of the rotation, when such of them which will not survive for another rotation may be removed and their number supplemented by others." Seemingly the retention of only such mature trees as would not arouse the cupidity of the contractor was prescribed. In addition, this working plan prescribed the retention of saplings of the *better species* of 9 inches girth below *at the base*. The object of this is not apparent. There is little doubt however that such prescriptions resulted in the retention of only small trees and hence havoc by wind damage was correspondingly great. Besides, the main object of the coppice with standard system, which is the production of timber trees of small timber dimensions could not be attained.

(5) Finally the retention as standards of species other than timber species, such as teak, *Pterocarpus marsupium*, Rosewood and *Terminalia paniculata* would seem to be a mistake. At present even fuel species such as various *Acacias*, *Agalias* and *Bauhinias* are so reserved.

171. *Conclusions.*—For all the reasons enumerated above it seems desirable to replace the " coppice with standard " by the " simple coppice " system with artificial regeneration of sparsely stocked areas combined with adequate fire protection and closure to grazing of atleast the ten youngest coupes. With a view to ensuring the supply of small timber, especially teak, the rotation, in such of the present coppice with standard fuel series as are capable of growing trees of small timber dimensions within economic limits, will have to be raised.

172. *Advantages of the simple coppice system.*—Briefly stated the advantage of this system are :—

(1) If coppicing is done properly it is generally acknowledged that the resulting coppice shoots soon develop an independent root system of their own. The whole forest is thus renewed at every rotation.

(2) The system is considerably easier to work through contract agency, the restrictions imposed on the contractor being fewer and the opportunities for his oppression by venal subordinates being considerably reduced.

(3) Unlike the coppice with standard a stem which can be successfully applied only to more or less homogenous crops, where the underwood species is shade bearing and the over wood species " light demanding ", the simple coppice system is of more universal application, and more suited to conditions in the local deciduous forests where there are over fifty different species, most of them being light demanders.

(4) Under the coppice with standard system there is a grave danger that the standards may become too old to produce vigorous coppice shoots. Thus the natural stocking of the forests will tend to decrease progressively. Again the retention of standards of any size means a definite loss of increment in the coppice crop coming up under their shade. These defects are not present in the simple coppice system.

173. *Natural regeneration.*—In both the coppice with standard and 'simple coppice' fuel series, natural coppice regeneration is good. In the former however, coppice regrowth of light demanders such as teak, in the vicinity of standards suffers to an appreciable extent from drip and shade. Natural regeneration from seed is excellent during the monsoons, but generally dies back annually owing to excessive drought or suppression by weedgrowth, until utimately a strong root system is developed, when given a favourable monsoon the

seedling shoots up and established itself. Teak and *Pterocarpus marsupium* especially behave in this manner. Seedlings of the latter with an extremely thick root collar showing from 10 to 20 annual rings, are a common feature in the forest. The period of establishment of seedling regeneration is therefore unduly long and with a view to obtaining normal stocking as quickly as possible, artificial regeneration is necessary.

174. *Artificial regeneration.*—There is little on record to show what exactly was done in this respect in the fuel coupes in the past. Mr. Richmond in 1903 first started sowing teak, rosewood and *Pterocarpus marsupium* in blanks, in the annual coupes of the Kuttalam felling series : further from the presence of *Sterospermum* and *Albizzia* poles in this series, it may be presumed that these species were also introduced at the time, as they are not found in the adjacent unworked forest ". This work was subsequently extended to most of the annual coupes worked under the coppice with standard system. The general method appears to have been to sow seeds of timber species in lines 10 feet apart. In the absence of subsequent tending, the seed lines were covered with grass and weeds and the operations were largely failures. Mr. P. M. Lushington in his inspection note on the division in 1915 says "cultural operations have been carried out on a considerable scale round Mundanthorai, and have undoubtedly shown some success with teak but I have not found any of the other species put down except as young plants. Here want of success is due to want of tending in subsequent years ". He accordingly ordered that these operations should be stopped as a whole, but advised the concentration of effect on *one* definite area, of large size, near Mundanthorai, so that accurate data of costs and results could be obtained, with a view to deciding whether the work was worth continuing. Accordingly lines 15 feet apart were cleared and seeds of *Pterocarpus marsupium, Hardwickia binata* and *Pongamia glabra* were dibbled on prepared mounds 1 foot high near Mundanthorai. The result was a failure, though why teak was not tried is not apparent. Mr. Barry, in 1921, remarked " since 1904 attempts at sowing and dibbling seed have been made in the felled coupes of most working circles, year after year with practically no result." The probable reasons for this continued failure are :—

(1) Most of the dibbling according to the control journals was done in June, i.e., after the burst of the south-west monsoon. It was only to be expected that the germinated seedlings could not survive the long break which usually follows the first burst of this monsoon. Dibbling is likely to be more successful if completed by the end of April.

(2) Suppression by weeds, grass and strobilanthes (*Stenosiphonium russelliarum*) was partially responsible for heavy casualties. Some method of dimenshing weed growth is indicated.

(3) The operations seem to have been carried out on too large a scale to admit of effective supervision. For instance 24½ miles seed lines where dibbled in old Coupe XX of Kalakad series and 106 acres dibbled in Coupe XXI of the same series.

Artificial regeneration was undertaken as prescribed by Mr. Lasrado in paragraphs 356 to 363 of his plan. The results have all been unsuccessful. In 1940 orders were received stopping further rab sowings. The District Forest Officer however raised fuel species by kumri method in some of the fuel coupes subsequent to 1943, and particulars of these operations are given in the respective control records. The operations on the whole are satisfactory and will be prescribed.

175. *Strobilanthes.*—The damage done by strobilanthes to young regeneration both natural artificial is very great. Though attempts were made in the past to eradicate this by removal in head-loads on the issue of head load tickets, the system was not continued probably because cutting back of strobilanthes had no effect on its subsequent growth. Then the system of leasing by auction in selected plot was tried, with no result. Periodical sales at long intervals were resorted to. One such sale was held in 1945 and the revenue realized was Rs. 700. Still the question of eradication seems an unsolvable problem. We cannot think of any other method of its complete eradication except to continue the auction sale at long intervals as per the discretion of the District Forest Officer.

176. *Evergreen timber working.*—The earliest working of the evergreen forests in the division seems to have occurred between 1888 and 1896 in the sholars of Srivilliputtur Range. The method adopted was to allow a contractor to fell principally *Vitex altissima, Filicium decipiens, Litsea zeylanica* and *Mesua ferrea* in the shola forests in the Chittar valley and convert them into small scantlings (spokes plough poles, etc.) which could be man handled down to the plains. Similar work was carried on in the sholas in Nanguneri range from 1897 to 1901, *Palaquium elipticum, Mesua ferrea* and *Bischofia javanic* being extracted. The contractor paid on the quantity of timber that he actually removed to the depot in the plains. In the absence of supervision of fellings and owing to the fact that conversion was affected by the axe, much wastage was involved and the system was abandoned. Mr. Richmond remarked in 1903 that under this system " a contract for a certain number of cubic feet was given to a contractor who was at liberty to take them from *anywhere* he liked,

and moreover if he cut down a tree and found it did not quite suit him, he worked on and cut down another and so on. It did not matter to him how many trees he destroyed as he only paid on the number of cubic feet he removed. Anything more wateful it would be difficult to imagine.

The next system tried was to sell marked trees standing in located areas. The felling cycle was 6 year and each working circle was therefore divided into 6 coupes. The following working circles were constituted.

Range.	*Total area.*	*Felling circle in years.*	*Girth limit at breast height.*	*Average annual possibility in tress.*	*Year of starting.*
	ACS.		FT.		
Srivilliputtur Range—					
Mylai Working Circle	705	6	6	50	1903
Vellakalteri Working Circle	1,810	6	4½	20	1903
Nanguneri Range—					
Karumandiamman Working Cricle ..	2,235	6	7	200	1903

The trees were to be selected and marked prior to felling and sold standing ; payment was to be made in lump sum for all trees standing and not calculated on the outturn. The following table for the Karumandiamman Shola Working Circle shows the results of working:

	Area in acres.	*Possibility trees.*	*Actually extracted trees.*	*Revenue.*
				RS.
Coupes I and II	438	400	210	436
Coupe III	280	200	141	426
Coupe IV	561	200	43	160
Coupe V	410	200	83	314
Coupe VI	499	200	60	536

It is obvious that the possibility was fixed too high as sufficient trees above the prescribed girth limit could not be found on the area. The revenue works out to Re. 0–13–0 per acre or Rs. 3–7–6 per tree felled. Details of working for the other working circles were not available. As early as 1904 Mr. Richmond had remarked "I do not think the system is a good one as it tends to favour bad species—which are not cut unless the greatest care is taken in the selection of the trees to be felled, none being marked except those surrounded by, or standing over a well established advance growth of the same or other valuable species." Again, the prescription that as little damage as possible should be done to the surrounding forest during felling could not be successfully carried out. In view of the importance of these sholas as protectors of the catchment areas of the more important irrigation streams, the possibility of destroying them by exploitation could not be contemplated, and in Boards Proceedings Forest No. 512 Miscellaneous, dated 9th April 1913 all shola exploitation was oredered to be stopped. Considering that these sholas were fairly accessible and moderately stocked with saleable species of large dimensions, the discouraging financial results of working doubtless also influenced the above decision.

In Ambasamudram range valuation surveys on representative areas had been carried out in the shola forest at Kannikatty and Kodamady as early as 1883, with a view to ascertaining the possibility of these forests. From 1886 to about 1896, an average of 6,000 cubic feet of *Hopea* and *Balanocarpus* were extracted annually from the Ullar, Upper Serviar and Kuduvarai valleys, all extraction being done departmentally, the cost of extraction averaging Rs. 0–12–6 per cubic foot. That these operations involved considerable wastage can be concluded from the fact that of 152 trees felled in the Kuduvarai valley in 1899 only 28 were converted. Mr. Hooper accordingly ordered the stoppage of operations until the forests were adequately opened out and the demand stimulated, as he was convinced that a considerable amount of over felling had been done in the past. After the construction of the Kodamady-Kuttalam Kalaruvi road in 1909–1910 extraction in the area west of the Usipothai saddle was attempted departmentally, but was soon abandoned as it did not prove lucrative. In 1910–11, 50 trees, principally *Vitex altissima* were sold standing in this locality to a contractor at Rs. 5–8–0 per tree in 1911–12 this system was again tried 50 trees again being sold at Rs. 6–8–0 per tree. The contractor must have made a good profit as an average nett yield of 150 c.feet per tree was obtained, one *Hopea* tree alone yielding 317 cubic feet the selling rate for *Hopea* scantlings at the time being Rs. 3 a cubic foot. In spite of this, contractors in the succeeding year refrained from offering good prices at the sale, and it was decided that in order to realize the full value of the tree, departmental working was the only solution. As sawyers had to be imported from Travancore the risks of advances proving unrecoverable, together with other defects of departmental working, discouraged and adventure in this direction. All extraction was therefore suspended pending the preparation of a working plan which did not materialize for reasons referred to in paragraph 166 above.

177. *Defects of the system of working.*—The principal defects of the shola working alluded to above were that no attempts were made either to encourage what natural regeneration of the more valuable species there was on the ground, or to supplement such regeneration by artificial means where necessary. This was the problem which was to be solved before shola extraction was started again in 1928.

178. *Remedies.*—Three alternatives suggested themselves :—

(1) the possibility of raising by the judicious girdling of inferior species, a sufficiency of regeneration of the valuable species in advance of felling so that the actual removal of the superior species would not materially effect the advance growth obtained. This was more or less the Shelterwood Compartment System modified to suit them needs of a forest with a large number of species, only a small proportion of which were valuable as timber ;

(2) the feasibility of regenerating gaps caused by selection fellings, artificially with valuable species.

(3) The desirability of tending such natural generation of the valuable species as existed over the whole of the annual coupe by cutting out inferior growth interfering with it, care being taken not to admit more light than would be necessary. Each of these alternative will be discussed below—

179. (1) *The securing of advance growth.*—Messrs. Latham and Peake between 1908 and 1912 had carried out various small scale experiments in opening up the canopy over young natural regeneration of *Balanocarpus, Gluta Hopea.* This work was continued by Mr. Barry who, by judicious cutting or girdling of trees standing over natural regeneration of *Hopea* and *Balanocarpus*, and by broad cast sowing of large quantities of seed of these species, was able to raise even aged crops over small area scattered over the forest. The so called "*Balanocarpus* areas" behind the kodamadi Rest-house, on the western face of Usipothai ridge, along the bridle path to Cox's Hut, and along the Kariar Kannikatty road, were all the results of Mr. Barry's enthusiasm in this direction. These results encouraged the belief that large scale operations on similar lines would be equally successful, and according it was decided in 1920 that the best method of exploitating the evergreens was to establish a mass of advance growth of the more valuable species about 5 years in advance of felling, so that when the felling of the overwood took place, sufficient even aged regeneration would remain undamaged to provide a new crop, potentially more valuable than the original crop. This object was to be attained by—

(*a*) the fostering of existing valuable natural regeneration and advance growth by a judicious and graduated opening of the canopy by girdling or felling undesirable species.

(*b*) the cutting of all climber growth.

(*c*) the supplementing of valuable natural regeneration where it was absent or insufficient by sowing or planting.

For this purpose the species were divided into three classes as shown below :—

Class		
A.	*B.*	*C.*
1 *Gluta travancorica.*	1 *Vitex altissima.*	
2 *Hopea parviflora.*	2 *Hardwickia pinnata.*	All the remaining species.
3 *Mesua ferrea.*	3 *Cullenia excelsa.*	
4 *Balanocarpus utilis.*	4 *Aglaia roxburgniana.*	
5 *Dysoxylum malabaricum.*	5 *Diospyros sp.*	
6 *Cedrela toona.*	6 *Eugenia sp.*	
7 *Artocarpus hirsuta.*	7 *Pygeum Wightianum.*	
8 *Filicium decipiens.*	8 *Pterospermum rubiginosum.*	
9 *Palacuium ellipticum.*	9 *Garcinia sp.*	
	10 *Ginnamomum sp.*	
	11 *Canarium strictum.*	

The work done in the first year was—

(*a*) the cutting of climbers, and C class species below 18 inches in girth, and depositing the debris in lines 6-10 feet apart to facilitate subsequent sowing and planting operations.

(*b*) the transplanting of about 3 months old seedlings of A class species in lines over a portion of the area.

(*c*) the broadcast sowing of such seeds of A and B class species as were readily obtainable.

In the second year item (*a*) was repeated and ln addition C class trees between 18 inches and 24 inches girth were girdled to let in more light. The latter operation as not undertaken over the whole regeneration area as prescribed, because there was not sufficient regeneration on the ground to justify further opening up of the canopy. Sowing and planting was again done over as much of the area as needed it.

180. *Results.*—The results are abstracted below :—

Locality. (1)	*Cost of felling C. Class pecies.* (2) RS. A. P.	*Dibbling and sowing number of measure of seeds.* (3)		*Planting (seedlings).* (4)		*Weeding.* (5) RS. A. P.	*Cost. Columns (3), (4), and (5).* (6) RS. A. P.	*Total cost.* (7) RS. A. P.
Kannikatty—								
1921–22 (81 acres) ..	652 6 6	*Balanocarpus*	60	*Hopea*	15111	..	71 10 9	724 1 3
		Cadrela	16					
		Pygeum	50					
		Eugenia	28					
		Gluta	28					
1922–23	44 14 0	*Mesua*	244	*Artocarpus hirsuta.*	571	9 8 0	213 7 0	267 13 0
		Gluta	380					
		Palaquim	254					
1923–24	67 11 0	*Gluta*	652	....		167 7 6	105 6 0	340 8 6
1924–25	..	*Hopea*	18	....		84 12 0	7 8 0	92 4 0
1925–26	10 5 0	....		....		..	..	10 5 0
								1,434 15 9
Kannikatty—								
1922–23 .. .. (89 acres).	838 8 0	*Palaquium*	186	*Artocarpus hirsuta.*	1250	..	199 15 6	1,038 7 6
		Balanocarpus	319					
		Chukrassia	6					
		Mesua	7					
		Eugenia	22					
1923–24	129 15 0	*Gluta*	969	*Hopea*			109 11 0	239 10 0
		Pygeum	16					
1924–25	..	....				96 0 0	..	96 0 0
								1,374 1 6
Kannikatty—								
1923–24 .. .. (53 acres).	531 13 6	*Gluta*	758	....		..	164 8 0	696 5 6
		Pygeum	68					
1924–25	88 12 0	*Mesua*	25	....		..	7 8 0	96 4 0
								792 9 6
Kodamadi—								
1921–22 .. .. (97 acres).	557 6 6	*Dysoxylom*	12	*Hopea*	6,644	..	168 4 0	725 10 6
		Balanocarpus	670	*Gluta*	1,544			
		Hardwickia	205	*Balano carpus.*	300			
		Cedrela	14					
		Pygeum	114					
		Vitex	5					
		Aglaia	1					
1922–23	442 8 0	*Hardwickia*	167	....		..	174 0 0	616 8 0
		Vitex	42					
		Mesua	120					
		Filicium	24					
		Gluta	347					
		Artocarpus	30					
		Chukrassia	10					
		Balanocarpus	162					
		Pygeum	8					
1923–24	145 10 0	*Gluta*	583	*Hopea*	20,240	..	144 9 0	290 3 0
		Pygeum	106	*Balanocarpus.*	4,075			
		Hardwickia	30					
		Filicium	2					
								1,632 5 6
Kodamadi—								
1922–23	950 9 0	*Hardwickia*	243	....		..	215 6 0	1,165 5 0
		Balanocarpus	1042					
		Mesua	136					
		Gluta	43					
		Pygeum	8					
		Palaquium	495					
1923–24	128 12 0	*Balanocarpus*	100	....		..	47 0 0	175 12 0
1924–25	..	*Dalbergia*	745	....		..	47 0 0	47 0 0
		Artocarpus	14					
		Terminalia tomentosa.	8					
								1,388 11 0
Kodamadi—								
1923–24 .. .. (51 acres).	522 7 0	*Gluta*	1,147	*Hopea* (one year old).	16,400	..	294 0 0	816 7 0
		Cedrela	1	*Balanocarpus*	500			
		Chukrassia	12					
		Filicium	7					
		Dalbergia	7					
		Balanocarpus	30					
		Pygeum	72					
		Hardwickia	17					
		Mesua	50					
1924–25	..	*Dalbergia*	765	....		..	67 12 0	67 12 0
		Artocarpus	7					
		Hopea	417					
		Terminalia	7					
								884 3 0

The results from year to year were pronounced most unsatisfactory. It is probable that with the limited knowledge of the silviculture of the various species, the light conditions which favoured the growth of a particular species were detrimental to the growth of others. The mistake made was to attempt to grow too many species under the same conditions. Large quantities of seed were destroyed by rodents and insects, and the little germination which occurred was destroyed by drought among other causes. The expense of these operations was also a serious drawback. Excluding overheads and interest charges which together would amount to a considerable amount, the following table shows the total expenditure incurred.

Locality.	*Area in acres.*	*Total expenditure.* RS.	A.	P.	*Expenditure per acre.* RS.	A.	P.
1 Kannikatty (1921–22)	81	1,435	0	0	17	11	0
2 Kannikatty (1922–23)	89	1,374	0	0	15	7	0
3 Kannikatty (1923–24)	53	793	0	0	15	0	0
4 Kodamadi (1921–22)	97	1,674	0	0	17	4	0
5 Kodamadi (1922–23)	103	1,389	0	0	13	8	0
6 Kodamadi (1923–24)	51	884	0	0	17	5	0

Again some of the important species such as *Hardwickia pinnata*, *Vitex altissima*, *Aglaia roxburghiana* were classed as B class together with inferior species like *Cullenia excelsa*, *Canarium strictum* and *Cinnamomum, sp.* and were consequently girdled or cut to favour A class species. The cutting or girdling of B and C class species up to 18 inches girth and the subsequent girdling of some B and C class species of 18 inches to 24 inches, girth opened out the canopy too much with the result that masses of inferior species, such as *Cinnamomum*, came in and swamped the regeneration of the better species. Finally the operations had to be done with labour recruited from the plains and it is highly probable that these coolies, owing to their ignorance of shola species, destroyed unwittingly a large quantity of the regeneration of the more valuable species in tending operations.

181. *The new policy.*—In 1927 therefore the hope of securing advance regeneration was definitely abandoned and the new policy of removing the exploitable trees first and regenerating the gaps subsequently was inaugurated. Mr. Kesava Vittal was posted on special duty for the purpose. His work may be discussed under the following heads :—

(*a*) Nursery practice,

(*b*) Artificial regeneration,

(*c*) Natural regeneration.

(*a*) *Nursery practice.*—The following tentative conclusions regarding evergreen nursery practice were arrived at from the work of the Special Officer.

(1) Fencing of the nursery was found to be essential in order to prevent the destruction of the seed and germinating seedlings by mousedeer, porcupine, squirrels, rats and vermin. A fence $4\frac{1}{2}$ feet high made of split reeds tied together almost touching each other was found quite effective and cost about Rs. 1–8–0 per chain.

(2) Care taken in the collection of good seed and dibbling it *as soon as possible* after collection was amply repaid by a high germination per cent.

(3) The depth of sowing should not exceed the thickness of the seed. A thin covering of leaf mould especially over small or light seeds was found to be advantageous.

(4) Watering during germination and periods of drought was necessary and was best done with a watering can having a fine spray.

(5) Seedlings from the open nursery, i.e., not under natural shade, stood transplanting better than from the shola nursery although the latter appeared to look more healthy.

(6) In the open nursery it was found advantageous, in order to prevent wilting of the seedlings, to shade the beds with reed screens, during the hottest part of the day.

182. (*b*) *Artificial regeneration.*—When a tree is felled a lot of damage is inevitably done to the surrounding forest, and a gap of varying dimensions, according to the height of the tree and the size of its crown is caused. The sawyer cuts out *all* saplings in the immediate vicinity of the tree trunk in order to erect the requisite scaffolding for sawing. The resulting leaf and small branch wood debris is generally burnt, as its retention is found to attract a species of gadjly which is a source of annoyance. Thus hardly any regeneration is left in the gaps undestroyed. After the rains some of the cut back saplings and seedlings send up side shoots which are more of the nature of pollard than coppice shoots. The gaps thus caused vary in extent from $\frac{1}{4}$ square chain to 1 square chain. Artificial regeneration is of two kinds, dibbling and transplanting of seedlings from the nursery.

(1) *Dibbling.*—The general conclusion arrived at was that the expense was not justified by the results obtained. Seeds of *Mesua*, *Balanocarpus*, *Eugenia*, and *Dysoxylum* were readily attacked by vermin or insects and destroyed. Seeds of *Aglaia poeciloneuron*.

Chukrassia and *Hopea* were available only at a time which did not synchronise with suitable rainfall conditions or dibbling. Other species like *Vitex* and *Cedrela* with very small seed having a low germinative capacity were better raised in a nursery prior to transplanting in the forest. *Heritiera Papilio, Gluta, Acrocarpus* were the only species which could be successfully dibbled.

(2) *Transplanting.*—The south-west monsoon generally bursts in the first week of June, and after a short break, it comes on again. It is during this second onset of the monsoon that the best results from transplanting were obtained. The following table shows at a glance the information collected on the subject of planting :—

Transplanting.

Species.	*Optimum age.*	*Optimum height.*	*Remarks.*
Mesua ferrea	1 Year.	4 inches.	Three to four months old seedlings give fair results.
Chukrasia tabularia	6 months.	6 inches.	
Balanocarpus utilis	3 months.	..	
Cedrela toona	6 months.	..	One year old stump plant were successfully planted out.
Dysoxylum malabaricum	9 months.	8 inches.	
Hardwickia plannata	6 months	..	
Acrocarpus Fraxinifolius	6 months.	6 inches.	One year old seedlings 1 foot to 1½ feet high were successfully stump planted.
Hopea parviflora	1 Year.	4 inches.	

Owing to the comparatively slow rate of growth the evergreens in early youth tending by cutting out weeds and grass directly interfering with the seedlings was found essential for a period of 2 years. The following table shows the results of enumeration in November 1932 of selected gaps in the various coupes :—

Species.	*Date of dibbling.*	*Planting.*	*Average percentage survivals.*	*Average height growth in inches in November 1952.*
				INCHES.
	Coupe I Kannikatty.			
1 *Acrocarpus*	June 1929 ..	November 1929 ..	58	72
2 *Aglala*	May 1930 ..	November 1939 ..	50	9
3 *Gluta*	July 1939 ..	....	40	15
4 *Chukrassia*	..	November 1939 ..	70	24
5 *Cedrela*	June 1929	November 1929 ..	38	24
6 *Mesua*	..	November 1929 ..	40	15
7 *Vateria*	December 1928 ..	December 1928 ..	..	30
	Coupe II Kannikatty.			
1 *Acrocarpus*	May 1930	..	61	60
2 *Mesua*	.. ..	June 1930 ..	60	14
3 *Aglala*	..	June 1930	61	6
4 *Hopea*	..	November 1930 ..	50	6
5 *Chukrassia*	..	October 1930 ..	75	42
6 *Balanocarpus*	December 1930 ..	..	100	6

It was discovered by experiment that it was advantageous to plant *Acrocarpus*, *Chukrassla* and *Vetex* seedlings in the centre of the gap where they could receive most light, and *Mesua* and *Hopea* seedlings near the periphery of the gap where there was the maximum of shade. *Gluta* seedlings did well in the intermediate speace. *Hope* and *Balanocarpus* did not seem thrive over an elevation of about 2,500 feet ; the two species are usually found in nature flourishing at elevations between 1,000 feet and 2,000 feet. The following table gives details of actual costs of the gap regeneration :—

Coupe number.	*Number of gaps.*	*Year of regeneration.*	*Cost of nursery.* RS. A. P.	*Cost of planting seeds.* RS. A. P.	*Dibbling.* RS. A. P.	*Weeding.* RS. A. P.
I	150	1928	10 0 0	..	1 8 0	..
		1929	3 0 0	9 12 0	21 10 0	..
		1930	..	..	..	4 6 0
II	105	1930	27 5 0	5 0 0	22 8 0	14 12 0
		1931	..	..	7 8 0	5 4 0
		1932	..	..	..	..

The total cost for 255 gaps thus amounted to Rs. 148–5–0 or Re. 0–9–1 per gap excluding interest charges. It must be borne in mind however, that much of the work of weeding

was done free of cost by local subordinates. Allowing for working on a larger scale and for increased efficiency due to experience and better organization the following charges per gap appear reasonable :—

	AS.
First year—	
Nursery charges	2½
Dibbling	2
Transplanting	3
Weeding	2½
Second year—	
Replacing casualties	2
Weeding	3
Third year—	
Weeding	4
Total .. Rs.	1-3-0

On the basis of an average of 2·5 gaps per acre, the expenditure per acre for the three year-period will be Rs. 2–15–6 or Rs. 3. Considering that a revenue of Rs. 16 per acre on the very conservative basis of Rs. 6 per tree is obtained from exploitation. An expenditure of Rs. 3 per acre on regeneration is not unjustified.

183. (*c*) *Natural regeneration.*—The desirability of tending existing natural regeneration over the whole annual coupe, by performing light cuttings, so as to free the more valuable species from suppression has exercised the minds of all Forest Officers who have had to deal with evergreen forests.

Past experience has shown however that it would be very injudicious to prescribe tending operations as :—

(*a*) the most favourable light conditions for the growth of our evergreen species has not yet been accuratelys tudied ;

(*b*) the species themselves are difficult to identify in the youthful stages and hence there is a grave danger that ignorant coolies and subordinates might cut out just the seedings and saplings which ought to be encouraged ;

(*c*) the cost of such an operation would be great, and in the absence of knowledge as to its utility, unjustified. An experimental tending over 1¼ acres in Kannikatty was found to require three coolies at a cost of Rs. 2–4–0. (The coolies however were new to the work.) Such research as has been conducted in the past on this subject warrants the assumption that tending would be helpful in increasing height growth. Details are available in plot files 5, 6 and 7 in the District Forest Office, but are not given here as the measurements were not recorded on a strictly comparable basis. For the period of Mr. Lasrado's working plan he felt it desirable therefore that tending of natural regeneration be restricted to an area (say 25 acres), in the annual coupe, on which the work can be supervised by the District Forest Officer in person. With increasing knowledge of the identity and silvicultural requirements of the valuable evergreen species, the area of such tending may be extended if the results justify such a procedure.

The prescription of Mr. Lasrado to carry out tending of natural regeneration over 25 acres, was carried out till 1942 when the Chief Conservator of Forests ordered that this should stop, as it was thought that the work was not worthwhile as the natural regeneration of suitable species was lacking. Attempts were also made to raise evergreen timber crop by planting seedlings of suitable timber species in the annual 10 acre plots near Kannikatty the year after cardamoms were planted. This method was also stopprd from 1942 onwards, as the total area of 50 acres fixed for planting of cardamoms was completed by then.

184. *Plantations.*—The subject will be treated under (*a*) teak plantations and (*b*) exotics. The earliest teak plantation in the division was made about 1888 in two patches, one near the Athithondu Rest House and the other about half a mile away in the Valaikulam Fuel Series. There are no records to show how it was raised, but both the soil and the locality were so unsuitable for teak that it is surprising that the plantation was raised at all. The two areas have been included in the Valaikulam 'simple coppice' fuel series and are worked on a rotation of 30 years.

(*a*) *Teak Plantations.*

185. *General.*—With a view to ascertaining the suitability of the semi evergreen forests, for teak, Mr. Richmond raised a small plantation of 0·91 acre at Kariar in 1907. The success of this plantation provoked succeeding District Forest Officers to plant this species

on similar areas on a larger scale. The labour of Kanis was enlisted in forming such plantations between 1912 and 1915 at Kariar under the "ponam" system, i.e., in conjunction with field crops. These plantations were a success. The 1912 plantation at Kariar in particular although small, being only 4·5 acres in extent is an unqualified success, and removes any doubt as to the possibility of making use of this system in the district. From 1917 onwards teak plantations were started in the Serviar valley near Kodamadi. There are some 395 acres of teak plantations in the Kariar and Serviar valleys. The teak plantations raised by Mr. Richmond and subsequently by others at Kariar valley have been submerged in the Hope Lake.

186. *Method of formation.*—The earliest departmental plantations were made by transplanting seedlings from a nursery, early in the north-east monsoon, i.e., October, November. In 1917 a departure from this procedure was effected, seedlings being transplanted in July during the south-west monsoon. Owing to the fact that nursery work was not well organized planting continued from July to November, the seedlings being transplanted as they become available into pits 1 foot cube, at an espacement of 6 feet by 6 feet. Casualties were naturally excessive being as high as 66 per cent in the 1917 plantation. In addition dibbling of teak was resorted to in order to reduce the replacement of casualties with nursery transplants. A combination of these two methods was adopted in all plantations raised up to 1925. In 1922 a small experiment in stump planting one year old teak stumps over an area of 3 acres in the current year's plantation, was carried out during the north-east monsoon. As was to be expected the growth did not compare favourably with the seedlings transplanted during the south-west monsoon.

187. *Stump planting.*—In the Kariar and Serviar valleys the south-west monsoon usually appears in late May or early June, and is preceded by three months of hot and dry weather during which the raising of seedlings in a nursery is a task which requires unremitting care and excessive watering and shading. This rules out the possibility of using seedlings for transplanting during the south-west monsoon. The north-east monsoon although more capricious, bursting as it does at any time between the last week of October and the first week of December, brings with it a greater *amount* of rainfall. Seedlings for transplanting during this monsoon can be raised without much difficulty during the preceding south-west monsoon the greatest objection to north-east monsoon planting however, is, that the seedlings have barely time to establish themselves before they are subjected to drought from February to early May. Casualties are therefore excessive. For these reasons, stump planting *as soon as* the south-west monsoon bursts or if the ground is soft enough, a few weeks earlier appears to be the most suitable method of planting. The reserve of flood material in the stump enables it to tide over rainless periods of short duration, and the deeper planting enables the stump to tap moisture levels of the soil. The success of the 1932 teak plantation at Kariar and Kodamadi may be attributed mainly to stump planting, although the work was not sufficiently organized to enable complete advantage to be taken of the rains of the south-west monsoon. It is essential for success and for reducing the costs of weeding and replacing casualties, to stump plant as soon as the ground is soft enough to receive the stump. Hence, burning and staking operations should be completed by the middle of April at the latest. The actual planting should also be so organized that it is completed over the whole area in as short a time as possible. Failures in the past have largely been due to dilatory planting spread over many months.

In recent plantations raised under the existing plan stumps from the nursery were planted in April or May at the first showers of the south-west monsoon (premonsoon planting). Casualties were replaced to obtain as full a stocking as possible in the first year itself.

188. *Condition of plantations.*—The neglected state of many of the older plantations of recent years has frequently been commented upon in the inspection notes of the division. The boundaries between the various plantations are so overgrown as to be practically unrecognizable, thus increasing the difficulties of making thinnings. It seems to have been the custom to leave a plantation to itself once it had been successfully established. Much suppression by creeper growth and fast growing softwood species such as, *Helicteres isora, Troema orientalia, Sterculia sp., Grewia sp, Pterospermum sp,* has occurred. The 1913 and 1914 Kani plantations contain huge *Terminalia arjuna* trees over 4 feet in girth which have already done immense damage to the teak. The neglected state of older plantations still continues and thinnings made in the previous years have been very light. A regular thinning programme is prescribed.

189. *The Kuttalam plantations.*—Small plantations from 10 to 22 acres in extent annually were raised in the worked coupes of Kuttalam Range series from 1935 to 1944. From 1945 onwards an area of 5 acres per year were clear-felled and planted with teak near the five falls road. The total area of the plantations raised from 1935 to-date is 193 acres. Raising of teak over an area of about 20 acres annually is being prescribed under regeneration Working Circle.

190. *Bamboos.*—The earliest attempt at introducing the bamboo, *bambusa arundinacea* was Haynes' Aladiyur bamboo plantation, raised about 1884 at a cost of Rs. 290. In 1922 Rs. 230 was realised by the sale of 1,000 bamboos from this area and 1,000 bamboos have been extracted annually ever since. The success of the Aladiyur plantation gave a great impetus to the planting of this bamboo in the division and between 1903 and 1912, it was introduced in Valliyur, Kombai Ar, Idaimuttikadai, Aladiyur, Kariar Sivasailam, Vallam, Talai Anai and Alagar Koil Valley in the division. Attempts were also made during the period from 1934 to 1944 to plant bamboo rhizomes in Aladiyur and Sengaiteri beats, with fairly satisfactory results.

191. *Bamboo prices.*—The opening of the Shencottah-Trivandrum railway line resulted in a distinct set-back to bamboo prices owing to the competition with bamboos from Travancore State. The prices, however, went abnormally high from 1943 to 1946 due to the demand during the Second World War. However there is a sudden fall from 1947 onwards, due to prevailing market conditions.

192. *Method of formation.*—The plantations seemed to have been raised by three methods :—

(1) Planting out one month old nursery seedling.

(2) Planting out off-sets.

(3) Planting out rhizomes cuttings.

In recent years only rhizomes cuttings have been tried.

193. *Extraction.*—The green bamboos to be extracted were being marked departmentally and sold standing to the contractors. Mr. Lasrado, however, felt that it was desirable to divide each bamboo area into three annual coupes and work it on a three-year rotation permitting the contractor to do his own felling. This of course has worked satisfactorily and the same method will be continued.

194. *Mahogany.*—Between 1887 and 1889 three acres were planted with Mahogany (*Swietenia mahogani* and *Swietenia macophylla*) in the Karivaiyur reserve now under Public Works Management and in the Mundanthorai and Kuttalam Bungalow compounds. The results were so gratifying that these species were introduced in the subsequent years in other areas. In 1906 further planting work was done in Kariar and in the Kuttalam felling series. But results were only partially successful. Mr. Lasrado did not prescribe any planting of Mahogany because, he thought this will not thrive due to unfavourable soil conditions. Nothing more will be done in respect of this species.

195. *Casuarina.*—Casuarina was first introduced in 1905 in the Valliyur reserve of the Nanguneri Range. The plantation (about 6½ acres) was raised at a great cost as it had to be watered for six years and nearly for about six months every year. It died naturally in 1930 and was sold for Rs. 1,500 as fuel, the average yield being 12 tons per acre. Mr. Lasrado did not prescribe planting of this species probably due to the difficulty of raising it and its slow growth. The scarcity for fuel, however, in recent war years made it a necessity to raise casuarina wherever possible. Casuarina plantations were therefore raised in this division also since 1941 in Teri reserved forest, Valliyur reserved forest and Papanasam Reserved Forest near Mundanthorai over an area of 109 acres, besides small areas of 1 to 5 acres in Airaperi, Sivasailam, Kuttalam, Mattalamparai and Vallam beats. Scarcity of water and the abnormal cost of labour did not justify further planting and the raising of casuarina departmentally was abandoned.

196. *Cassia siamea.*—Though some experiments were undertaken towards planting of this species prior to Mr. Lasrado plan nothing was done during the period from 1934 to-date.

(*d*) *Afforestation.*

197. *The Kudiramozhiteri reserve.*—This reserve hereinafter alluded to as Teri has been referred to in paragraph 15 above. From as early as 1848 attempts were made to fix the great masses of shifting sand in the reserve with the object of saving the cultivated lands on the eastern edge from being destroyed by the sand blown over by the furious winds which rage in the area from June to October. At first these efforts consisted in encouraging ryots to take blocks of land on *cowle* tenure, and to plant up the area gradually with tree growth principally the palmyra, in conjunction with field crops where possible. The response in the early years was gratifying and besides palmyra, seed of *Acacia planifrons*, *Dalbergia multiflora* and *Dodonea viscosa* were sown with ragi and other cereals, but the disappointing results discouraged further private enterprise in this direction. Later the success of the system of penning goats fed on pods of *Acacia planifrons* in afforesting the sandy areas on the coast led to its adoption in the Teri but the results owing presumably to the deeper water level and the shifting sand, were again disappointing. Private enterprise having so signally failed, it was considered necessary to reclaim the area through

Government Agency, and some 13,400 acres was reserved (vide G.O. No. 636, dated 21st June 1892). The whole reserve consists of characteristic red sand the origin of which is obscure. Mr. Lasrado's working plan prescribed :—

(1) Dibbling of palmyra nuts 10 feet by 10 feet over 100 acres annually.

(2) Cashew seeds 24 feet by 24 feet over 5 acres.

(3) Raising of fuel plantations over 5 acres annually.

The results of the operations were reviewed and it was decided that only palmyra sowing should be continued as it was found satisfactory and that the other prescriptions should be discontinued. After prolonged correspondence the District Forest Officer was accorded permission to continue cashew sowing also.

198. The palmyra is being used extensively in the afforestation of the Teri. Even according to Mr. Lasrado's working plan palmyra dibbling was continued over about 100 acres annually. The whole reserve contains a fair stock of palmyras.

199. A brief discussion of the merits and demerits of palmyra planting will not be out of place here. In the Teri reserve two distinct conditions are recognizable. The first, is the area of fixed or stationary sand dunes in Nadu Teri and Kalpallam, and the second, the area comprising most of Teri Series V where there are moving sand dunes or alternatively no sand dunes, but stretches of moving sand. The latter are the so-called " sand supply areas " which feed the dunes by action. The prevailing wind direction during eight months of the year, i.e., from March to the middle of October, varies slightly between west-south-west to west-north-west or a few points north or south of west. During this season the winds are violent and the sand being dry is more apt to be shifted by them, than during the north-east monsoon when the winds are usually of less intensity and the sand more moist and heavy. It is only the west wind which therefore needs consideration, and afforestation should therefore logically start from the west and proceed towards the east.

200. *Advantages of palmyra dibbling.*—The principal advantages of large scale mechanical dibbling of palmyra nuts are—

(1) The technique of dibbling has been so highly developed that little departmental supervision is necessary for successful planting.

(2) The cost is comparatively low, amounting to Re. 1–4–0 per acre in 1933.

(3) The stocking of the reserve with palmyras, if successful, would ultimately provide the raw for the expansion of various local industries such as " pathnir " boiling for jaggery manufacture, basket making from the leaves, fibre making from the leaf sheath or " pathel " and toddy from the building inflorescence. The timber from the palmyra would also find a ready market.

201. *Disadvantages.*—As against these advantages, the following drawbacks may be advanced :—

(1) The plamyra is very slow growing in early youth in these parts, reaching a height of 3 feet after 10 years and this only in the more favourable localities. Hence, dibbled at an espacement of 10 feet by 10 feet such plantations will not serve as efficient wind breaks even if full stocking is assured, until the trees are 10–15 years old.

(2) Pure plantations of this species under the unfavourable rainfall and soil conditions prevalent on the Teri, are particularly liable to disease, from insect or fungus attack. In fact the borer *Orytes rhnoceros* has already appeared on the Teri and killed a number of palmyras. If the attack becomes epidemic, we run the serious risk of lossing all our palmyras.

(3) Palmyra plantations on sand supply areas, such as practically the whole of Teri Series V, are very likely to be submerged by moving sand dunes. The process can be seen in progress in the 1932 plantations, while further east whole trees of *Odina wodier*, palmyra and cashew, 40 feet in height and more have been buried in the sand, only the tops appearing above it.

202. *Reclamation agents.*—The principal qualities of a sand reclamation agent are—

(*a*) It should be capable of propagating itself rapidly without assistance.

(*b*) It should provide fairly dense and fairly low cover judged by either or both of these standards the plamyra will be found wanting. An examination of reclaimed areas on the Teri will demonstrate that certain creeping grasses (*Spinifex sp.*). *Dodonea viscosa* and *Borreria hispida* are the most important agents. The encouragement of these species by artificial means, should really *precede* palmyra planting in order to ensure that the latter are not subsequently obliterated by shifting sand.

203. *Conclusions.*—On a consideration of the pros and cons therefore it appears to be desirable to reduce considerably the annual area to be planted with palmyra more particularly as the area remaining to be planted in the Teri series and O'neil extensions series is the worst yet tackled, being a mass of shifting sand. It would be more advisable to concentrate our energies on devising some comparatively inexpensive but efficient method of afforesting the western part of the Teri and when this has been done, afforestation can proceed eastward. The following measures merit consideration and will be prescribed on an experimental scale :—

(*a*) The cashew (*Anacardium occidentale*) besides providing a very appreciable annual revenue once it starts bearing, is one of ideal trees from the stand point of reclamation as it has a huge low spreading crown and is not browsed by cattle. Unfortunately it is difficult to raise without watering in the early stages. The northern edge of Kachinavilai series (reclaimed area) adjacent to the Kadamba tank seems to be the ideal place for introducing it, as watering will not present any difficulties owing to the proximity of the tank and its channels. Experimental plantations here with the ultimate idea of increasing the area planted, if the results justify such a step, will be prescribed.

(*b*) It is also desirable that the main rights of way across the Teri reserve be distinguished on the ground by avenues. At present it is almost impossible to know where one is, once one has walked into the Teri beyond sight of the Forest bungalow at Nazareth. The old working plan prescribed the annual planting of a mile of road with banyan cuttings. This salutary prescription has been responsible for such little shade as now exists on the Teri roads. The banyan is the ideal tree for this area as it can be raised from cuttings and extends naturally by aerial roots and attracts birds, which are valuable for spreading seed. *Odina wodier* too can be raised from cuttings. A regular scheme of avenue planting is therefore desirable.

(*c*) From experiments made recently it is seen that *Prosopis juliflora* and *Inga dulcis* would come up well and serve as a wind brake. Planting of these species will also be prescribed.

204. *Palmyra leases.*—The present system of leasing out the usufruct of palmyras for a term of 5 years on an annual rental is not conducive to the securing of maximum revenue as if the quinquennial sales occur at a period or general depression in the prices of palmyra produce, the bids will be proportionately low. However, the system was introduced in the past as it was feared that annual leases would result in the lessee over working the palmyras in order to secure the maximum revenue during the period of his contract. The need for preventing the gradual destruction of palmyras from this cause on these sparsely covered areas, is paramount to revenue considerations and it therefore seems advisable to adopt a middle course by reducing the lease period to 3 years. A stricter application of the existing rules to prevent overcutting of leaves is desirable ; the control exercised in the past on this important point has been of a perfunctory character. The right to collect minor forest produce (cashewnut and screwpine flowers) will be continued.

205. *Disreservation.*—In 1922 Mr. E. Periyanayagam, M.L.C., moved the Collector for the disreservation of a portion of the Teri with a view to provide the neighbouring villages with enlarged grazing grounds and land for cultivation purposes. An aggregate area of 1,952 acres of reclaimed land in the Nazareth and Semmarikulam series was accordingly selected and handed over to Revenue Department for assignment in January 1925, in accordance with G.O. No. 2157, Development, dated 19th September 1924. In November 1924 further proposals for disreservation were made but were fortunately not entertained as the land previously disreserved had not yet been assigned. No assignment of the 1,952 acres has been made up to date and the area being open to unrestricted grazing and cutting of palmyra leaves is likely to revert in time to its original unreclaimed state, thus providing a menace to our efforts at reclamation of the Nazareth series on the leeward side of the disreserved area. As a grazing area the strip disreserved is of hardly any value. The fact that it has not been assigned for eight years shows that as cultivable land it is equally worthless. The Collector attempted a solution of the problem by ordering the constitution of a Panchayat for the area but in view of the amounts we expended on the reclamation of the area in the past, and considering its position on the windward side of the present reserve, much better protection would be afforded by reservation. After prolonged correspondence 1,472 acres of this area of 1,952 acres were again reserved in Notification No. 141, dated 17th February 1937.

206. *The policy of disreservation.*—The folly of such disreservation can be realised from the fact that past experience has invariably shown that when such sandy wastes get to the stage when they are incapable of growing a crop of *Acacia planifrons*, or an occasional crop of horsegram or other cereal, there is a invariably tendency on the part of the pattadar to abandon the land. In 1010 a *cowle* was granted to M. S. Vairanatha Pillai for an area of 2,446 acres adjoining Neduvakurichi and Arasur villages in Tirchendur

taluk for a period of 25 years rent free. Nothing beyond the raising of a few fields crops over a small portion of the area, and some desultory attempts at planting with palmyra nuts was done, and the cowle was revoked in 1915.

207. *Grazing.*—As early as 1894 grazing was permitted in portions of Semmarikulam and Nazareth series. Mr. Bryant who saw the damage done, excluded grazing entirely from the Teri reserve from 1895 to 1898. Subsequently he reopened the Semmarikulam series, but as permits were taken for only five buffaloes and 69 cows, the compartment was reclosed. In 1899 Mr. Jackson on the recommendation of the Ranger, opened Semmarikulam and a portion of Kachinavilai series but on inspection he found that grazing would be most inadvisable and closure was again resorted to Mr. P. M. Lushington's plan in 1901 definitely prescribed closure of the whole reserve to grazing. In December 1914, on account of heavy floods in the Srivaikuntam taluk and the consequent submersion of village pasture lands, the whole of the Teri was thrown open to free grazing, under the personal orders of the Forest Commissioner. The concession was withdrawn in April 1915 as its continuance was not found essential, the requirements of reclamation being held to be superior to the claims of grazing advanced by the surrounding ryots. In spite of this, again from 1st July 1924, a belt of land half a mile wide along the boundary of the Teri was thrown open to free grazing. Mr. Barry strongly protested against this, on the ground that past experience had fully proved the inadvisability of permitting grazing even on payment, and that free grazing would inevitably result in the destruction of the work of the past 40 years. In the absence of demarcated boundaries showing the limits of the half mile belt, it was impossible for the subordinates to say whether cattle were trespassing, so that even if cattle were impounded the case would inevitably have been thrown out in court for lack of sufficient evidence on this point. Protection in the circumstances was farcical. This protest, however, was not effective as the Chief Conservator ordered that the grazing on the half mile belt was permitted "with the knowledge and approval of Government" and the decision could not be revoked. In 1926 the Chief Conservator reported to Government that as reclamation work on a large scale was proposed to be carried out, the privilege of free grazing in the half mile belt should be withdrawn. Accordingly in G.O. Ms. No. 820, Development, dated 4th June 1927, all grazing in the Teri was prohibited. When the area of 1,472 acres was reserved in Notification No. 141, dated 17th February 1937, grazing was also allowed in the area on payment of grazing fees.

208. *Semi-wild cattle.*—The problem of semi-wild cattle alluded to in paragraph 64 above remains to be solved. There are a number of these cattle (200 to 400 according to various estimates) which roam over the Teri and are for all practical purposes ownerless. As early as 1918 the need for the destruction or removal of these animals was felt and in G.O. Ms. No. 685, Revenue, dated 18th February 1918, it was ordered that semi-wild cattle found in the Teri would be presumed to be ownerless and either caught or destroyed. Shikaris were paid Re. 1 for every animal shot and were also given the option of purchasing the animal destroyed for Rs. 3 cattle which could be caught were to be impounded and not shot. About a dozen animals were destroyed in this manner according to the records, but since the shikaris were intimidated by the local population, who professed to own the cattle the concession had to be withdrawn for lack of volunteers to shoot the animals. In 1928 three months warning in the District Gazette was given to all owners to remove their cattle from the reserve, and at the end of this period the right to capture the remaining cattle was put up to auction. The lessee was to receive three-fourths of the sale-proceeds of all the captured animals and was to provide his own equipment, ropes, etc., for the operations. The idea was to drive the cattle into ambushed nets and thereby entangle and capture them. No information is available as to the results of this operation, but local enquiries show that the attempts were unsuccessful as the nets could not be staked to the ground sufficiently strongly to hold the captured animals. If we are going to continue spending thousands of rupees on planting this area up with palmyra and other useful species, with the purpose of preventing the shifting sand from ultimately overwhelming acres of wet cultivation which lies to the east of the reserve, it is obvious that to allow some two or three hundred cattle to prejudice our chances of success would be the height of folly. It must be realised that there is little if any grazing in the area apart from our nice succulent young one or two-year old palmyra plants, and the semi-wild cattle no doubt appreciate the expansive efforts we make to cater for them. The damage done to the surface soil of the reserve by trampling and converting it to loose sand which is easily blown about, also greatly hinders its fixation. Our attempts at getting rid of the cattle in the past have been neither persistent nor organised. Unless the ryot is sure that we mean business it is useless to expect him either to remove his cattle or assist us in their removal. The fact that from time to time calves are captured and taken to the village, with the object of attracting their mothers to come and feed them and incidentally be milked by the owner, is well known. Young bulls are also frequently captured, tamed and sold, with or without the knowledge and connivance of the local subordinates. It is quite clear therefore that the owners of these semi-wild cattle treat that reserve as a

private grazing ground to their own profit and to the detriment of regeneration operations. Capturing operations *departmentally* in the adjacent Vallanad reserve have proved a failure financially (*vide* paragraph 54).

Paragraph 471 of Mr. Lasrado's working plan prescribes that semi-wild cattle in Vallanad and Teri reserves should be captured from time to time. Three attempts have been made, and all concerned are of the opinion that this method is not satisfactory.

One of the difficulties in the Teri is the very open nature of the terrain which makes approach almost impossible. Mr. Hicks has worked out some figures with the idea of making levy on all villages adjoining the Teri, but the amount for each village is so small as not to be worth the dissatisfaction which it would cause.

The District Forest Officer does not think that the number of semi-wild cattle in the Teri are very great. But it is probable that there are more in the dry weather. As there is laterally no grazing at all even now, after good rain, I cannot see that this reserve can ever support cattle in any number.

(*e*) *Fire Protection.*

209. *General.*—Dr. Brandis first pointed out the destructive effect of fires in the ghat forests of the division and suggested that if the object of management was to make the streams flow more evenly and to increase the dry weather supply in rivers, fire protection was the main point to be aimed at. The ghat forests at the time had suffered more from annual fires than from excessive felling. The task of protection however was realized to be one of unusual difficulty owing to the rugged nature of the country. His proposals were briefly :—

(*a*) To secure the assistance of the persons who graze cattle in the forest. This was to be done by restricting free grazing to areas outside fire protected blocks. Within latter the grazing was to be leased to responsible person with whom an agreement was to be made, in which it was stipulated that on the occurrence of fires the block would be closed forthwith, but if the contractor assisted in fire protection, the contract would be continued to him.

(*b*) to regulate the shifting cultivation practised by the Kanis.

(*c*) to clear and burn fire lines, bearing in mind the facts that fire-lines are useless in a hilly country unless a practicable path is opened out along side, and that tracts stocked with grass are always a source of danger and should be burnt early in the season. All pathswere to be fire traced.

The present Nanguneri and Ambasamudram Ranges including the Kuttalam reserve were divided into six beats each under a Forest Guard. Fire Watchers were proposed to be employed in the fire season each man being responsible for a certain length of line or path leading through the forest. The annual cost of fire protection for the first five years was expected to be Rs. 10,000.

210. *Early methods.*—In 1884 the first regular attempt at fire protection of a block of 40 square miles between the Serviar and the Kariar was attempted. The following was the expenditure in the various ranges up to 1895–96 :—

Name of reserve.	*Date of operations started.*	*Area specially protected.*	*Expenditure.*	*Average per annum.*
			RS.	
Srivilliputtur	1888–89	11,000	3,485	498
Kuttalam	1888–89	37,000	8,000	1,143
Ambasamudram	1884–85	25,000	14,718	1,338
Nanguneri	1884–85	21,000	7,496	681

In 1896 Mr. Hooper said " It is evident that the cost of protection is amassing a heap of debt against the forest and the irregular and unsatisfactory returns of protected area each season point to the doubtful success of the operation. It is for urgent consideration whether to extend rigid fire protection to any area under simple closure except it be under regeneration. It will be found that with a concentration of our efforts and funds on areas felled in the preceding five years we shall be quite as successful as in the past if we limit our work in the remaining ghat forests not yet under systematic working to the putting out of fires that may occur." He therefore, limited expenditure on fire protection to the following amounts per annum :—

Range.	Amount.
	RS.
	RS.
Srivilliputtur	300
Kuttalam	500
Ambasamudram	500
Nanguneri	600

211. *Results.*—That this step was justified is clear from the inspection note of 1898 which said "I consider the District Forest Officer has acted wisely in discontinuing to clear the length of fire lines cleared annually in former years, and relied more on the rule which has for a long time been in force in Tirunelveli of not permitting grazing for some years after a portion of the reserve has been wilfully burnt. The organized system prevailing in Tirunelveli of beating out fires the moment they occur is also partly responsible." In 1898 the total expenditure on fire protection was further limited to Rs. 1,000 a year. In 1901 however, it was felt that the increased working prescribed by the working plans just sanctioned, justified a greater expenditure on fire protection of the various working circles.

The average annual expenditure on fire protection for the period 1901–02 to 1912–13 was Rs. 2,293.

212. *Later modifications.*—In 1913–14 as a result of Mr. Peake's representation as ambitious programme for fire protecting the whole of the fuel series and the hill grazing compartments by a system of external and internal fire lines was sanctioned. All the common Zamin and State forest boundaries not passing through Shola forest were also fire traced annually. The average annual expenditure on maintaining the fire lines and paying fire patrols for the period 1913–14 to 1921–22 both years iinclusive, amounted to the large sum of Rs. 4,781.

213. *Results.*—The following table shows the results of fire protection during the above period. The area under general protection was 206,712 acres while that under special protection was 35,688 acres.

Year.	*Fires in specially protected area acres.*	*Percentage of area burnt.*	*Fires in generally protected area acres.*	*Percentage of area burnt.*	*Total cost of operation.*
					RS.
1913	4,080	11·4	4,633	2·3	5,042
1914	5,111	14·3	2,320	1·1	5,444
1915	1,277	3·6	5,723	2·8	5,100
1916	2,392	6·7	5,285	2·5	4,764
1917	3	..	4,817	2·3	4,935
1918	74	0·2	11,899	6·2	4,527
1919	1,709	4·8	2,545	1·2	4,900
1920	3,052	6·5	2,779	1·3	4,419
1921	1,917	5·3	9.534	4·1	5,132
1922	2,866	8·0	6,503	3·1	2,842

214. *Recent methods.*—The need for greater economy in expenditure was realised in 1922. Many of the expenditures interior fire lines were definitely abandoned and the old system of employing fire patrols during the fire season and fire tracing only frontier boundaries where necessary, resuscitated. Although the administration reports for the period 1922–23 to 1932–33 make a distinction between areas specially protected and areas generally protected, in actual practice only general protection alluded to above is now undertaken over the whole of the ghat forests. The following table shows the results of general protection over an area of 242,937 acres.—

Year.	*Area burnt in acres.*	*Percentage to area protected.*	*Total cost of operation.*
			RS.
1936	5,920	2·6	997
1937	26,490	10·5	866
1938	13,796	4·8	1,043
1939	10,919	3·9	1,049
1940	5,233	2·3	1,079
1941	8,555	3·1	1,024
1942	10,051	3·7	915
1943	7,044	3·0	987
1944	10,564	3·8	1,119
1945	9,838	3·6	1,300
1946	7,135	3·1	1,484

The percentage of area successfully protected compares very favourably with that obtained under the more expensive system in the previous period.

215. *Conclusions.*—From a detailed examination of fire protection problem in the division, the following appear to be the essentials for successful protection :—

(*a*) The application of *immediate* closure to all grazing, of areas in which serious fires have occurred. Any fire over 500 acres in extent can ordinarily be considered serious.

(*b*) The fire tracing of the common boundary between Government forests and all Zamin and State forests, where it does not pass through Shola forest.

(*c*) The fire tracing of important roads and paths through the forest which are frequently used.

(*d*) The maintenance of fire lines along certain important ridges with a view to protecting sandal areas fuel areas, and the catchment basins of important streams.

(*e*) The maintenance of a close watch by all beat subordinates during the fire season over their beats, and the immediate putting out of all fires as soon as they are observed, either with the assistance of fire patrols for the smaller fires, or with the assistance of then nearest villagers under section 23 of the Forest Act.

(*f*) The greater insistence, by frequent inspections, on the rule that all charcoal pits in fuel coupes should be fire traced to a circumstance of 30 feet round them.

(*g*) The closure to grazing during the periods of the plan of such of the hill grazing compartments as certain shola growth in the interests of extension of the shola which are so important from the irrigation point of view. Such areas although they contain grass of sorts are too steep for cattle and no hardship will be caused to grazing interests as they are seldom if ever visited by village cattle.

216. *Regeneration areas.*—The special protection of regeneration areas such as fuel coupes is not advocated as the terrain in most of the ghat fuel series is so rugged that internal fire lines without a path alongside them would be of little use. Moreover the value of such forests does not justify excessive expenditure on special protection. Most of the fires in these areas of recent years have crossed over from adjacent Zamin and State forests; all that is necessary therefore is to prevent this by maintaining adequately wide fire lines along the common boundaries between Zamin and State forests on the one hand and Government forests on the other.

217. *Contributions.*—Some of the Zamindars, for example, Chokkampatti and Tirumalai Naicken Pudukudi are alive to the necessity for fire protection and have expressed their willingness to contribute cash or to provide labour for the maintenance of fire lines along their common boundaries. It is advisable that these contributions be put on a permanent basis. The Travancore State has also agreed to share half the cost of clearance of boundaries subject to the condition set out in paragraph 33 above.

SECTION 3. SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN.

218. *Roads.*—The following statement gives a list of forest roads and bridle paths constructed and maintained by the Forest Department in the division with details of costs and year of construction. The roads have been classified according to their usefulness for extraction and inspection purposes during the period of the plan into three classes; the first consists of roads on which expenditure will have to be incurred annually for repairs; the second consists of roads which can ordinarily be maintained by subordinates but for which expenditure may have to be incurred periodically for special repairs; the last consists of roads which are so unimportant either for extraction or inspection purposes that no expenditure on them can be justified.

Serial number and description.	*Length.*		*Cost of construction.*			*Year of construction.*		*Remarks.*
	M.	F.	RS.	A.	P.			
A. ROADS AND PATHS REQUIRING REGULAR ANNUAL REPAIRS.								
Srivilliputtur Range.								
1 Mudangiar-Ayyanarkoil road	1	5½	1,649	12	0	1926–27	..	Earth road, transferred to Local Fund department.
2 Talamalaiyankoil-Pulliyuthu-Virusadai bridle path.	6	1	1,650	0	0	1893	..	Do.
3 Athithondu-Puliyuthu bridle path ..	4	2	500	0	0	1894	..	Connecting with No. 2.
4 Virusadi-Mudaliaruthu bridle path ..	1	4	500	0	0	1897	..	Do.
5 Mudaliaruthu-Chittar bridle path ..	6	4	995	0	0	1905	..	....
Kuttalam Range.								
6 Shenbagadevi bridle path	4	3	1,088	0	0	1891–92	..	For use of pilgrims and inspection.
7 Tekkumalai bridle path	2	3	157	0	0	Do.	..	Do.
8 Puckle's path in Kuttalam Reserve ..	3	4	..			Do.	..	....
9 Papanasam-Kariar road	7	3	45,959	0	0	1942	..	....
10 Kariar-Kannikatty new diversion road.	7	1	5,000	0	0	1945	..	Transferred from H.E. Department.
11 Pechiammankoil-Kuduvarai road ..	8	2	1,993	0	0	1886–87 1898–99 1909–10 1909–10	.. ..	Earth road.
12 Mudanthorai-Kodamady-Kuttalam-Kullaruvi road.	10	2	2,318	0	0	1913–14	..	Do.
13 Kariar-Karuthalipudai road	3	0	650	0	0	1894	..	Do.
14 Moolagajam-Taravittanparai road ..	2	5	665	0	0	1901	..	Do.

Serial number and description.	*Length.* M.	F.	*Cost of construction.* RS.	A.	P.	*Year of construction.*	*Remarks.*
A. Roads and Paths requiring regular annual repairs—*cont.*							
Kuttalam Range—cont.							
15 Bridle path to Knapp's hut	0	7	..			..	Continuation of No. 13.
16 Bridle path from Knapp's hut to Wood's hut.	2	4	..			..	Continuation of No. 13.
17 Bridle path from Wood's hut to Cox's hut.	10	0	..			..	Continuation of No. 13.
18 Bridle path from Cox's hut to Kuduvarai.	7	0	..			..	Continuation of No. 13.
19 Trace from Wood's hut to Martin's hut.	6	3	..			..	Proposed to be converted into bridle path.
20 Bridle path from Martin's hut to Kannikatty.	7	0	..			..	....
21 Bridle path from Kannikatty to Kalivelipil.	3	4	795	0	0	1897–98 ..	About 2 miles. is an earth cart-track.
Nanguneri Range.							
22 Kalakad-Sivanaperi road	1	1	648	0	0	1901 ..	Metalled.
23 Sivanaperi-Mudalaruppan road	4	5	3,523	0	0	1884–85 .. 1899–00 ..	Earth road.
24 Nadugani bridle path	5	5	Transferred from Local Fund Department.				Two miles have been converted into cart-track by contractors.
25 Bridle path connecting Mudalaruppan, Sengalteri-Netterikal and Nambiar subordinates lines.	17	5	3,148	0	0	1899–00 ..	....
26 Vadagarai-Arasapathu road and extension.	5	2	2,437	0	0	1906–07 .. 1917–18 ..	Earth road.
27 Kopparai cart-track	2	4	1,025	0	0	1906–07 ..	Do.
B. Communications requiring periodical repairs.							
Srivilliputtur Range.							
28 Chittar-Vairavakan Shola-Khansapuram bridle path.	8	0	1,815	0	0	1910 and 1914.	....
29 Ayyanarkoil-Chinna Vellakalteri Popuparai bridle path.	7	1	3,624	0	0	1893–94 .. 1903–04 ..	....
30 Gundamanaickanur path..	4	0	370	0	0	1913 ..	....
Kuttalam Range.							
31 Budatarkoil bridle path	2	1	1,750	0	0	1886–87 ..	....
32 Milaparai-Puliyangudi road	1	5	300	0	0	1893 ..	Earth road.
33 Kotanteri road	3	3	4,040	0	0	1893–94 ..	Do.
34 Base line in Vasudevanallur Reserve ..	7	6	396	0	0	1895–96 ..	This is a cleared line.
35 Five Falls road	2	4	210	0	0	1901 ..	....
36 Krishnapuram valley bridle path and Kuliratti cart-track.	5	$\frac{3}{4}$	1,014	0	0	1901 .. 1928–29 ..	The cart-track is mile 0–2–7½ in length.
37 Kottamalai Ar bridle path	3	0	29	0	0	1911–12 ..	....
38 Puliyangudi road	1	$3\frac{1}{2}$	429	0	0	1917–18 ..	Earth road.
39 Vallam cart-track through old coupes 1-3 in Kuttalam F. S.	2	$4\frac{3}{4}$	2,085	0	0	1921–22 .. 1925 ..	Do.
40 Approach to old Karuppasamikoil bungalow site.	0	3	50	0	0	1896 ..	Do.
41 Vallam revenue survey line	1	4	100	0	0	1895–96 ..	....
Ambasamudram Range.							
42 Branch road from road No. 13 to Kodamady rest house.	0	4	266	0	0	1917–18 ..	Earth road.
43 Thirthakarai road	2	4	500	0	0	1895–96 ..	Do.
44 Cairns line road	2	4	755	0	0	1898–99 ..	Do.
45 Aladiyur road in Koilteri F.S.	2	4	By contractor.			1920–21 ..	Do.
Nanguneri Range.							
46 Pachaiyar-Vadagarai revenue survey line.	2	6	435	0	0	1904–05 ..	....
47 North cart-track from R.F. boundary in Kalakad Felling Series.	3	$1\frac{1}{2}$	2,525	0	0	1920–21 ..	Earth road.
48 South cart-track from Reserve Forest boundary in Kalakad Felling Series.	1	$2\frac{1}{2}$	2,500	0	0	1921–22 ..	Do.
49 Tulukanparai bridle path	2	5	1,100	0	0	1909–10 ..	....
50 Mudalaruppan to Mungilpattikidai valley bridle path.	3	0	..			.. ..	....
C. Communications to be written off.							
Srivilliputtur Range.							
1 Cart-track in old coupes VII and VIII in Ayyanarkoil Felling Series.	1	3	609	0	0	1926–27	....
2 Cart-track in coupe IX, Ayyanarkoil Felling Series.	0	3	466	0	0	1927–28 ..	....
3 Cart-track in coupe XI, Ayyanarkoil Felling Series.	0	$5\frac{1}{2}$	266	0	0	1929–30 ..	....
4 Cart track in coupe X, Ayyanarkoil Felling Series.	0	5	571	8	0	1928–29 ..	....

Serial number and description.	Length M.	Length F.	Cost of construction. RS.	A.	P.	Year of construction.		Remarks.
C. COMMUNICATIONS TO BE WRITTEN OFF—*cont.*								
Kuttalam Range.								
5 Bridle path from Buhatarkoil to old Palayar Hut.	3	0	..			..		....
6 Kallimalai bridle path	4	0	1,250	0	0	1893–94	..	....
7 Nelliyuthu cart-track	3	4	626	0	0	1893–94	..	Earth road.
8 Road to old coupes VI and VII Kuttalam Felling Series.	1	4	594	0	0	1926–27	..	Do.
9 Road to old coupe IV, Kadayanallur ..	0	6½	570	0	0	1926–27	..	Do.
10 Cart track through coupes XXI and XXII Puliyangudi Working Circle.	1	2	240	0	0	1927–28 } 1928–29 }	..	....
Ambasamudram Range.								
11 Thailathu odai trace	1	6	65	0	0	1918–19	..	....
12 Thailathu bridle path	0	2-2/5	47	0	0	1916–17	..	....
13 Road to old coupe XXVIII, Padarmalai Felling Series.	0	4	1,158	8	0	1926–27	..	....
14 Road to old coupe XXIX, Padarmalai Felling Series.	0	7	683	0	0	1927–28	..	....
15 Nathalodai trace	1	5	8	0	0	1920–21	..	....
16 Ullar trace	0	5	50	0	0	1916–17	..	....
17 Kalivelipil to Travancore boundary bridle path.	2	5	749	0	0	1897–98	..	....
18 Kannikatty trace	1	3	50	0	0	1916–17	..	....
Nanguneri Range.								
19 Kapparai bridle path	1	1/8	410	0	0	1907–08	..	....
20 Branch road in old coupe IV, Kalakad Felling Series.	0	2⅛	205	0	0	1922–23	..	....
21 Cart track connecting North and South cart tracks in Kalakad Felling Series.	0	2	75	0	0	1925–26	..	....
22 Mudalakuppan to old coupe XXII Kalakad Felling Series road.	1	1	616	0	0	1909–10 } 1911 }	..	Earth road.

No new roads are necessary as fuel working in the division has been well organized, most of the fuel felling series being in their second or third rotation. In the evergreen timber working circle the value of the growing stock does not justify the construction of roads, as not only will the construction and maintenance of roads in such rugged country be expensive but man handling of scantlings to the nearest cart-track has been found by experience to be cheapest method of extraction.

219. *Buildings.*—The following statements give lists of buildings and wells constructed and maintained by the Forest Department in the division with details of costs and year of construction :—

(i) *List of buildings.*

Serial number.	Description.	Year of construction.	Cost of construction. RS.
	RESIDENTIAL BUILDINGS.		
	CLASS I.		
1	Range quarters at Srivilliputtur	1911	3,920
2	Do. Kadayanallur	1893–94	3,345
3	Do. Ambasamudram	1925	3,996
4	Do. Sivanaperi	1898–99	1,300
	CLASS II.		
	Srivilliputtur Range.		
1	Subordinates' quarters at Mudangiar	1945	3,500
2	Do. Athithondu	1893	787
3	Do. Mudaliaruthu	1896	260
4	Do. Pudupatti	1912	1,046
5	Foresters' quarters at Pudupatti	1929–30	1,310
6	Do. Mudangiar	1945	1,800
	Kuttalam Range.		
7	Subordinates' quarters at Kuttalam	1895–96	375
8	Do. Chellapuli	1909–10	2,030
9	Foresters' quarters at Chellapuli	1913	978
10	Subordinates' quarters at Melapuliyangudi	1916	1,816
	Ambasamudram Range.		
11	Forest Guards' quarters at Papanasam	1897–98	850
12	Foresters' quarters at Papanasam	1925	1,040
13	Do. Kodamady	1925	2,181
14	Do. Kodamadu	1916	1,179
15	Subordinates' quarters at Sivasailam	1912–13	1,882
16	Foresters' quarters at Mundanthorai	1894–95	643
17	Forest Guards' quarters at Mundanthorai	1903–04	800
18	Watchers' quarters at Mundanthorai	1914	2,354
19	Forest Guards' quarters at Kannikatty	1912–13	1,400
20	Coolie lines at Kannikatty	1922	989

Serial number.	Description.	Year of construction.	Cost of construction. RS.
	(i) List of buildings—cont.		
	RESIDENTIAL BUILDINGS—*cont.*		
	CLASS II—*cont.*		
	Nanguneri Range.		
21	Subordinates' quarters at Sivanaperi	1908–09	1,023
22	Do. Koovapatti	1887	485
23	Do. Nambiar site	1916–17	1,787
	NON-RESIDENTIAL BUILDINGS.		
	Srivilliputtur Range.		
1	Range office at Srivilliputtur	1911	2,540
2	Rest-house Athithondu	1894	1,623
3	Do. Mudaliaruthu	1897	2,035
4	Do. Pudupatti	1896	2,050
	Kuttalam Range.		
5	Range office at Kadayanallur	1896–97	643
6	Rest-house at Kuttalam	1890–91	3,278
7	Range Inspection Shed at Kuttalam	1945	1,500
8	Rest house at Chellapuli	1911–12	1,345
9	Inspection Bungalow at Naranapuram	1910–11	1,755
	Ambasamudram Range.		
10	Range Officers' Inspection Shed at Papanasam	1897–99 and 1915–16.	1,031
11	Do. Kodamady	1915–16	870
12	Rest house at Kodamady	1917–18	1,910
13	Coolie lines at Kodamady	1922	940
14	Knapp's hut	1925	4,580
15	Wood's hut	1925	2,520
16	Cox's hut	1925	2,520
17	Rest-house at Sivasailam	1893–94	910
18	Rest-house at Mundanthorai	1892–93	2,758
19	Lower-rest house at Kannikatty	1889–90	2,420
20	Upper rest house at Kannikatty	1925	7,070
21	Rangers' Inspection Shed at Mundanthorai	1918–19 and 1921–22.	1,951
22	Range Office at Ambasamudram	1887–88 1944	2,705 1,442
23	Martin's hut at Kandhavavarai	1925	2,694
	Nanguneri Range.		
24	Rest-house at Sivanaperi	1888–89	2,051
25	Range office at Sivanaperi	1898–99	1,120
26	Rest-house at Sengalteri	1906–07	3,867
27	Do. Vallanad	1893–94	1,195
28	Do. Nazareth	1893–94	1,204
	(ii) *List of wells.*		
	Srivilliputtur Range.		
1	Well at At hithondu rest-house	1894	90
2	Do. Pudupatti rest-house	1896	100
3	Do. Mudangiar rest-house	1896	180
4	Do. Range quarters, Srivilliputtur	1911	75
	Kuttalam Range.		
5	Well at Range quertes, Kadayanallur	1896–97	150
6	Do. Inspection Bungalow, Naranapuram	1888–89	347
	Ambasamudram Range.		
7	Well at Range quarters, Kodamady at Ambasamudram	1899	200
8	Do. Sivasailam rest house	1893–94	..
9	Do. Range quarters, Kannikatty at Ambasamudram	1928–29	288
	Nanguneri Range.		
10	Well attached to rest-house at Sivanaperi	1901–02	151
11	Well at Nazareth Bungalow	1893–94	..

The division is fairly well supplied with rest-houses; the construction of new quarters for subordinates is not recommended as it has been found that the subordinates rarely occupy even such of the existing subordinate quarters which are not close to villages, although rent is collected from them for occupation. Two inspection sheds, one in the Kariar valley of Ambasamudram Range to facilitate inspection of the existing teak plantations prescribed in the clear felling working circle and another in the Ammankoil valley of Srivilliputtur Range to supervise the important regeneration operations prescribed in the Ayyanarkoil timber-*cum*-fuel felling series will be necessary.

SECTION 4.—PAST YIELDS.

220. *Forest produce.*—The only big timber available in the division is evergreen timber. The various fuel series provide only small timber principally teak. The following statement shows the quantities of timber and fuel marketed in the decade preceding the working plan :—

	Timber in logs.	*Poles.*	*Sawn or squared timber.*	*Miscellaneous.*	*Fuel.*
	C.FT.	C.FT.	C.FT.	C.FT.	C.FT.
(1)	(2)	(3)	(4)	(5)	(6)
1923–24	27,000	17,000	7,000	6,000	757,000
1924–25	4,000	2,000	2,000	31,000	436,000
1925–26	10,000	1,000	56,000	..	603,000
1926–27	11,000	6,000	15,000	28,000	539,000
1927–28	29,000	8,000	5,000	6,000	710,000
1928–29	81,000	4,000	17,000	3,000	821,000
1929–30	58,000	4,000	18,000	6,000	682,000
1930–31	70,000	1,000	17,000	3,000	580,000
1931–32	6,000	1,000	12,000	33,000	1,115,000
1932–33	..	8,000	..	31,000	2,552,000
Total ..	296,000	52,000	149,000	147,000	8,795,000
Average ..	29,600	5,200	14,900	14,700	879,500

Since these figures are based on contractors accounts practically all extraction having been done through the agency of contractors, they can be said to be only approximately correct.

The yield from minor forest produce and bamboos is given in terms of money in paragraph 221 below.

SECTION 5.—PAST REVENUE.

221. *Revenue.*—The following statement shows the net revenue from various items of forest produce in the division during the past ten years :—

	Timber in logs.	*Poles.*	*Sawn or squared timber.*	*Miscellaneous (charcoal).*	*Fuel.*
	C.FT.	C.FT.	C.FT.	C.FT.	C.FT.
(1)	(2)	(3)	(4)	(5)	(6)
1936–37	6,205	800	8,800	75,450	541,750
1937–38	17,804	3,280	23,280	66,150	599,100
1938–39	18,259	2,560	..	64,000	490,700
1939–40	23,231	2,440	32,360	82,000	413,000
1940–41	320	6,840	17,070	72,950	486,050
1941–42	25,540	3,618	6,925	101,150	499,000
1942–43	20,380	2,363	14,239	83,200	579,250
1943–44	37,795 }	16,763	84,636	72,250	528,250
1944–45	21,185 }			61,100	363,800
1945–46	40,135	60	25,500	61,500	719,250

Statement showing Revenue under different heads, 1923–24 *to* 1932–33.

Year.	*Timber.*	*Fuel and charcoal.*	*Bamboo.*	*Sandal.*	*Grazing and fodder grass.*	*Other minor produce.*	*Confiscated produce.*	*Miscellaneous.*	*Totals.*	*Refunds.*	*Totals.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
1923–24 ..	1,485	144,419	987	814	13,023	35,714	398	10,894	2,07,734	201	2,07,533
1924–25 ..	1,453	1,52,606	1,212	877	12,877	42,361	1,099	11,173	2,24,658	469	2,24,189
1925–26 ..	2,305	1,69,843	2,314	920	13,615	39,699	1,333	10,119	2,40,148	138	2,40,010
1926–27 ..	306	1,17,954	1,035	2,270	9,640	39,766	1,358	10,862	1,85,191	64	1,85,127
1927–28 ..	539	1,09,980	790	1,650	9,284	34,939	1,228	12,656	1,71,066	34	1,71,032
1928–29 ..	7,522	94,610	849	1,155	8,740	30,454	839	12,360	1,56,529	428	1,56,101
1929–30 ..	4,619	1,10,740	899	5,769	7,442	29,615	1,669	11,785	1,72,538	350	1,72,188
1930–31 ..	9,022	1,04,041	1,920	1,763	8,426	26,827	1,091	11,274	1,64,364	90	1,64,274
1931–32 ..	7,042	65,959	1,071	6,031	7,296	21,272	1,644	13,248	1,23,553	155	1,23,398
1932–33 ..	4,666	41,857	1,668	4,817	7,942	24,548	804	11,391	97,793	429	97,364
Totals ..	38,959	11,12,009	12,765	26,066	98,275	3,25,195	11,463	1,15,962	17,43,574	2,358	17,41,216
Average ..	3,896	1,11,201	1,276	2,607	9,828	32,519	1,146	11,596	1,74,357	236	1,74,122
1936–37 ..	2,544	82,197	1,139	2,120	8,409	18,661	8,956	..	1,24,026	787	1,23,239
1937–38 ..	3,527	72,773	2,982	1,797	9,601	8,272	3,265	36,300	1,38,517	..	1,38,517
1938–39 ..	5,448	76,097	1,154	1,220	6,757	7,648	172	57,323	1,55,899	..	1,55,899
1939–40 ..	14,350	90,871	1,396	1,870	8,698	9,221	65	18,582	1,45,053	..	1,45,053
1940–41 ..	9,132	78,633	1,283	3,269	6,605	8,283	126	39,056	1,46,387	..	1,46,387
1941–42 ..	57,221	62,993	18,760	11,209	6,515	5,975	127	1,654	1,69,454	..	1,69,454
1942–43 ..	23,520	1,57,004	3,865	8,748	6,549	19,752	1,567	87,055	3,08,060	..	3,08,060
1943–44 ..	1,78,597	6,09,502	4,047	21,936	7,402	25,415	4,488	7,36,931	31,88,318	..	31,88,318
1944–45 ..	1,59,909	5,63,071	26,705	9,387	8,236	57,522	334	47,035	38,72,199	..	38,72,199
1945–46 ..	1,10,455	5,43,519	10,293	11,270	8,833	44,053	2,110	29,695	7,50,228	..	7,50,228
Total ..	5,64,703	23,36,660	71,624	72,826	77,605	2,05,202	18,210	10,53,631	86,98,141	787	86,97,354
Average ..	56,470	2,33,666	7,162	7,283	7,761	20,520	1,821	1,05,363	8,69,814	78	8,69,735

222. *Expenditure.*—The following statement shows the net expenditure incurred in the division under the different heads during the past ten years :—

Statement showing expenditure incurred from 1923–24 *to* 1932–33.

Year.	*Roads.* (1) RS.	*Buildings.* (2) RS.	*Other works.* (3) RS.	*Depart-mental extraction.* (4) RS.	*By private agency.* (5) RS.	*Demarca-tion.* (6) RS.	*Cultural operations.* (7) RS.
1923–24 ..	4,279	4,554	1,263	165	5,238	41	4,891
1924–25 ..	4,837	10,131	2,423	18	5,374	561	2,740
1925–26 ..	6,736	4,864	20	3,314	5,080	20	927
1926–27 ..	7,849	3,710	570	315	4,872	15	11,175
1927–28 ..	6,481	4,634	439	2,845	5,142	..	113
1928–29 ..	5,950	3,788	943	12,834	6,355	50	851
1929–30 ..	5,707	3,213	633	3,814	6,743	68	2,978
1930–31 ..	6,127	3,597	359	6,296	6,890	3	2,941
1931–32 ..	3,797	2,583	82	3,796	6,909	167	1,254
1932–33 ..	4,054	2,889	301	847	6,488	81	1,895
Total ..	55,817	43,963	7,033	34,208	59,091	1,006	19,765
Average ..	5,582	4,396	703	3,421	5,909	101	1,976
1936–37 ..	3,596	1,890	439	196	6,658	213	1,100
1937–38 ..	3,745	2,357	937	208	6,693	211	1,100
1938–39 ..	2,782	4,776	76	1,763	7,525	146	1,400
1939–40 ..	4,850	2,740	706	1,788	6,907	135	1,600
1940–41 ..	2,664	2,235	426	818	6,441	200	1,800
1941–42 ..	3,257	2,428	403	335	6,788	116	3,597
1942–43 ..	3,509	1,494	184	53,498	8,127	317	6,000
1943–44 ..	3,821	3,569	31	54,882	50,358	186	19,500
1944–45 ..	7,718	2,627	59	7,248	12,678	185	8,500
1945–46 ..	11,082	8,219	53	800	16,847	188	5,900
Total ..	47,024	32,065	3,314	1,21,536	1,29,022	1,896	50,497
Average ..	4,702	3,206	311	12,153	12,902	189	5,049

Year.	*Fire protection.* (8) RS.	*Establish-ment.* (9) RS.	*Allow-ances.* (10) RS.	*Contin-gencies.* (11) RS.	*Miscella-neous.* (12) RS.	*Total.* (13) RS.
1923–24 ..	1,574	63,123	8,355	2,026	1,089	96,598
1924–25 ..	792	60,857	13,562	2,356	3,235	1,06,850
1925–26 ..	856	64,253	11,263	2,306	596	1,00,235
1926–27 ..	676	54,735	10,956	1,745	6,108	92,726
1927–28 ..	574	57,886	8,911	2,143	2,610	91,778
1928–29 ..	..	49,647	9,293	2,155	1,327	93,193
1929–30 ..	343	47,809	7,658	2,100	2,103	83,169
1930–31 ..	439	44,817	7,045	2,190	3,139	83,843
1931–32 ..	389	44,492	6,596	2,023	1,265	73,353
1932–33 ..	413	44,319	5,824	2,031	2,601	71,743
Total ..	6,056	5,31,938	89,463	21,075	24,073	8,93,488
Average ..	606	53,194	8,946	2,107	2,407	89,349
1936–37 ..	813	50,561	7,413	2,752	408	76,039
1937–38 ..	866	51,579	7,258	2,182	625	77,861
1938–39 ..	1,043	54,637	8,335	2,084	1,095	85,662
1939–40 ..	1,049	51,138	7,298	2,059	118	80,118
1940–41 ..	1,079	48,528	6,514	1,029	980	72,714
1941–42 ..	1,024	50,529	6,586	1,943	423	78,428
1942–43 ..	915	44,824	8,413	2,486	5,146	1,44,912
1943–44 ..	987	47,884	16,149	2,045	1,01,236	13,00,648
1944–45 ..	1,118	47,799	20,793	2,299	4,17,769	15,26,793
1945–46 ..	1,300	46,413	32,017	2,611	2,144	1,27,574
Total ..	10,194	4,93,882	1,20,776	21,490	5,29,954	35,70,750
Average ..	1,019	49,388	12,077	2,149	52,995	3,57,075

223. *The surplus.*—The following statement shows the nett surplus for the period 1923–24 to 1932–33 :—

Year.	*Total revenue.*	*Total expenditure.*	*Surplus.*
	RS.	RS.	RS.
1923–24	2,07,533	96,598	1,10,935
1924–25	2,24,189	1,06,850	1,17,339
1925–26	2,40,010	1,0,235	1,39,775
1926–27	1,85,127	92,726	92,401
1927–28	1,71,032	91,778	79,254
1928–29	1,56,101	93,193	62,908
1929–30	1,72,188	83,169	89,019
1930–31	1,64,274	83,843	80,431
1931–32	1,23,398	73,353	50,045
1932–33	97,364	71,743	25,621
Total ..	17,41,216	8,93,488	8,47,728
Average ..	1,82,650	91,305	91,345

N.B.—The sudden fall in the surplus during 1931–32 is due to the effect of the prevailing agricultural depression. The figures for 1932–33 is not strictly comparable as owing to a change in the period of working of fuel coupes from the calendar to the official year, only half the fuel revenue for this year was credited in the accounts. This year has therefore been ignored in striking the average annual surplus.

The following statement shows the nett surplus for the decennium 1936–37 to 1945–46 :—

	RS.	RS.	RS.
1936–37	1,23,239	76,039	47,200
1937–38	1,38,517	77,861	60,656
1938–39	1,55,899	85,622	70,277
1939–40	1,45,053	80,118	64,935
1940–41	1,46,387	71,714	73,673
1941–42	1,69,454	78,428	91,026
1942–43	3,08,060	1,44,913	1,63,147
1943–44	31,88,318	13,00,648	18,87,670
1944–45	38,72,199	15,26,793	23,45,406
1945–46	7,50,228	1,27,574	6,22,654

The sudden rise of receipts in the years 1942–43 to 1944–45 was due to Military Supplies undertaken departmentally, and also to inflated conditions in the sale price of firewood and charcoal.

CHAPTER VI—STATISTICS OF GROWTH AND YIELD.

224. *Timber.*—The only big timber available in the division is evergreen timber. Since trees in evergreen forests have practically no break in the growing season, no annual rings are present. Statistics of growth can therefore be collected only by measurements of sample plots or trees over a period of years. No such measurements are available at present in Madras. In the absence of evergreen plantations of known age in the division the collection of reliable statistics is difficult.

225. *Small timber.*—With a view to discovering whether there was any financial justification for replacing the "coppice with standard" system by the "simple coppice" system, stem analysis of some of the principal deciduous species prevalent in the division was attempted. At the outset it was found that annual rings could not be distinguished with any degree of certainty on *Pterocarpus marsupium* on account of the heavy exudation of resin ; sections of *Chloroxylon swietenia* split so badly after felling that measurements of diameters could not be made with accuracy although annual rings were clearly visible ; sections of *Albizzia lebbek* showed pseudo rings and in some cases occluded bark. Teak alone lent itself admirably for stem analysis. It may be added however that the trees selected were not strictly comparable, as some showed distinct rings of suppression in early youth probably under standards or due to fires, while others owing to their sudden release from suppression caused by their retention as standards developed rapid girth increment for a period of years.

The following trees were ultimately stem analysed :—

Serial number and locality.	*Species.*	*Girth at breast height in inches.*	*Length of bole in feet.*	*Total age in years.*	*Volume in cubic feet.*
(1)	(2)	(3)	(4)	(5)	(6)
1 Kalakad Felling Series.	Teak	33·75	18	60	4·7826
2 Do.	Do.	23·25	19½	50	3·2664
3 Do.	Do.	27·00	18	53	4·2924
4 Do.	Do.	24·00	19½	44	4·1802
5 Do.	Do.	34·00	33	50	9·7845
6 Do.	Do.	34·00	31½	65	10·0526
7 Do.	Do.	28·00	25	59	5·0882
8 Do.	Do.	33·75	27	68	9·9357

Serial nnmber and locality. (1)	Species. (2)	Girth at breast height in inches. (3)	Length of bole in feet. (4)	Tatal age in years. (5)	Volume in cubic feet. (5)
9 Mundanthorai plateau.	Teak.	43·25	39	64	15·7884
10 Do.	Do.	53·00	44	85	30·9034
11 Do.	Do.	46·00	39	64	22·9185
12 Do.	Do.	42·75	39	56	19·6599
13 Do.	Do.	37·50	39	55	13·7301
14 Do.	Do.	39·00	32	72	15·3064
15 Do.	Do.	42·00	27	80	11·6322
16 Do.	Do.	28·00	27	54	5·8962
17 Do.	Do.	37·50	21	45	10·0080
18 Do.	Do.	32·50	39	45	10·7287
19 Ayyanarkoil felling series.	Do.	67·50	30	60	33·1356
20 Do.	Do.	51·50	36	45	24·5880
21 Do.	Do.	50·50	12	45	12·4134
22 Do.	Do.	52·75	36	45	22·1040
23 Do.	Do.	51·00	24	68	19·5126
24 Do.	Chloroxylon swietenia ..	58·00	12	60	13·1412
25 Do.	Do. ..	51·00	12	66	13·2396
26 Do.	Teak	46·00	36	60	20·5506
27 Do.	Do.	45·00	$24\frac{1}{2}$	52	16·7478
28 Do.	Do.	55·00	$18\frac{3}{4}$	70	18·0666
29 Do.	Albizzia lebbeck ..	66·00	$18\frac{1}{4}$	55	37·4928
30 Do.	Teak	38·00	$29\frac{3}{4}$	52	13·4508
31 Do.	Do.	44·50	$30\frac{1}{2}$	55	15·3870
32 Do.	Do.	$30\frac{1}{2}$	$30\frac{1}{2}$	65	14·4870

The average mean annual volume increment as revealed by stem analysis was 0·1500 cubic foot, 0·2525 cubic foot, and 0·3412 cubic foot for teak in the Kalakad felling series, the Mundanthorai plateau and the Ayyanarkoil felling series, respectively. The average mean annual breast height girth increment per annum was 0·53, 0·65 and 0·87 inches for teak in the Kalakad felling series, the Mundanthorai plateau and the Ayyanarkoil felling series, respectively. Graphs of the mean annual increment were drawn and although no definite conclusions could be drawn from them, many of the curves showed a marked falling off of the mean annual increment between 35 and 45 years. The graphs are recorded in No. A 297 of 1931 in the Working Plans Conservator's office.

226. *Conclusions.*—The mean annual increment, however, is not a good criterion for the determination of the financial rotation because teak under 25 inches mid-girth sells at Rs. 100 per ton or Rs. 2 per cubic foot of 50 lb. while teak between 25 and 40 inches girth sells at Rs. 5 per cubic foot. There is thus a marked price increment in the price once the 25 inches girth limit is passed. Considering the stunted nature of the teak in our fuel felling series it may be assumed without appreciable error that teak poles are 12 feet in length on an average and hence the girth measurements at 6 feet alone need be considered.

From the graphs, the following girth limits are attained at 30, 40 and 50 years, respectively :—

	Ayyanarkoil felling series.	Mundanthorai plateau.	Kalakad felling series.
30 years—			
Minimum	16·81	14·30	9·42
Maximum	27·65	24·51	16·96
40 years—			
Minimum	22·00	19·47	13·51
Maximum	37·71	30·80	22·00
50 years—			
Minimum	28·60	23·87	18·27
Maximum	47·12	34·87	27·65

It will be seen that not even a 50-year rotation will give us a 25 inches tree in Kalakad felling series save in the most favoured localities ; while at Mundanthorai and Ayyanarkoil, a very fair percentage of the crop at 40 years old would be over 25 inches girth. On a 30-year old rotation under the existing system, with the exception of a small percentage of the crop in the Ayyanarkoil felling series, no tree in the other localities would attain 25 inches in girth and hence the whole of the teak in the annual coupe with the exceptions of standards reserved in the last rotation will be saleable only at the lower rate of Rs. 2 a cubic foot. On a 40 year rotation, however, although the majority of teak in the Kalakad felling series will still remain in the lower price class, a very fair percentage of the crop in the remaining localities will be in the higher price also. It only remains to be discussed whether the revenue from the standards on a 30-year rotation would compensate for the increased yield from simple coppice on a 40-year rotation.

The following table shows the anticipated yield from the various maxima and minima diameter classes on the assumption that only a 12 feet hole is obtainable from all trees :—

Rotation.	*Ayyanarkoil felling series.*			*Mundanthorai plateau.*			*Kalakad felling series.*		
	D	*B.A.*	*V.*	*D.*	*B.A.*	*V.*	*D.*	*B.A.*	*V.*
30 years—									
Minimum ..	5.35	0·1561	1·8722	4·55	0·1129	1·3548	3·0	0.0491	0·5892
Maximum ..	8·80	0·4224	5·0688	7·88	0·3319	3·9728	5·4	0·1590	1·9080
40 years—									
Minimum ..	7·00	0·2673	3·2076	6·20	0·2096	2·5152	4·3	0·1009	1·2108
Maximum ..	12·00	0·7854	9·4248	9·80	0·5238	6·2856	7·0	0·2673	3·2018
50 years—									
Minimum ..	9·11	0·4517	5·4204	7·60	0·3151	3·7812	5·8	0·1835	2·2020
Maximum ..	10·00	1·2272	14·7264	11·10	0·6721	8·0652	8·7	0·4224	5·0688

N.B.—D. = Diameter in inches. B.A. = Basal area in square feet. V. = Volume in cubic feet.

Under the present system 15 to 20 standards are reserved per acre. The futility of reserving as standards, species other than teak is too obvious to need comment ; in many of the fuel felling series even evergreens like *Aglaia diospyros*, *Euginea sp.* are being reserved in spite of the fact that they are not timber species. On the assumption that 10 of the 20 standards reserved per acre are teak (a very liberal estimate) the yield from standards on a 30-year rotation would be—

In Ayyanarkoil series—54 to 147 cubic feet per acre.

In Mundanthorai—38 to 80 cubic feet per acre.

In Kalakad series—22 to 50 cubic feet per acre.

On the assumption that all these standards would be over 25 inches girth at the time of felling (an assumption not justifiable in Kalakad felling series) the money yield per acre from standards would be—

In Ayyanarkoil series—Rs. 270 to Rs. 720 per acre.

In Mundanthorai—Rs. 190 to Rs. 400 per acre.

In Kalakad series—Rs. 110 to Rs. 250 per acre.

On a ' Simple coppice ' rotation of 30 year this revenue can be obtained—

In Ayyanarkoil series from 135 to 360 trees.

In Mundanthorai from 95 to 200 trees.

In Kalakad series, 55 to 125 trees.

There is thus obviously some justification for the regeneration of the ' Coppice with standard ' system on a 30-year rotation in all the localities as even at an espacement of 18 feet by 18 feet the number of trees per acre amounts only to 134. Let us consider a ' Simple coppice ' rotation of 40 years here, the volume of the standards can be easily obtained in all localities as shown below :—

	Ayyanarkoil series.	*Mundanthorai.*	*Kalakad series.*
	C.FT.	C.FT.	C.FT.
Minimum tree volume	3·2076	2·5152	1·2108
Maximum tree volume	9·4248	6·2856	3·2018
Average tree volume	6·3	4·4	2·2

The yield from standards can therefore be obtained in Ayyanarkoil series from 147/6·3=23·3 to 54/6·3=8·5, i.e., from 8·5 to 23·3 trees per acre. Similarly for Mundanthorai, 8·6 to 18·1 trees per acre and for Kalakad 10 to 22·7 trees per acre. It will thus be seen that these figures are well within the bounds of possibility and that a strong case even on financial grounds has been made out in favour of conversion to a 40-year simple coppice rotation. The case of working, the great reduction in friction between the department and contractors are also arguments in favour of the simple coppice system ; in addition there is the possibility that the regenerative power of standard stools may be greatly reduced with age and that the standards themselves may cause serious suppression of the valuable coppice regeneration coming up under them as most of the deciduous species are strong light demanders.

227. *Teak plantations.*—The following table gives particulars of statistics collected in 1934 by measurements of ½ acre sample plots in the older teak plantations in the division. Further enumerations and measurements were not carried out as the result obtained were

not significant and satisfactory inferences could not be made. There was also the fact that when the Hydro-Electric Scheme was started a large number of the subsequent plantations were submerged in the newly formed Hope Lake.

Locality.	*Year of formation.*	*Height of tallest trees in feet.*	*Height of smallest trees in feet.*	*Height of average trees in feet.*	*Girth at breast height of average trees.*	*Number of trees per acre.*	*Average breast height girth increment in inches per annum.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kariar	1907	95	20	58	28·4	217	1·10
Do.	1912	105	45	72	30 4	224	1·44
Do.	1913	70	25	50	24·3	280	1·21
Do.	1914	52	15	40	15·2	196	0·80
Do.	1915	50	9	35	14·4	592	0·80
Do.	1922	50	7	39	13·2	684	1·20
Do.	1923	50	12	38	12·7	870	1·27
Do.	1924	48	7	38	12·7	884	1·41
Serviar	1917	46	10	38	15·6	706	0·97
Do.	1922	31	6·5	17·5	7·9	988	0·72
Do.	1923	41	7·5	25·5	10·6	744	1·06
Do.	1924	36	6	24	9·5	404	1·06

228. *Sandal.*—Sandalwood was being extracted according to the prescriptions laid down in Ladcase's plan and the yield according to girth classes is not separately available. The yield approximately works out to 9 tons on an average per annum.

CHAPTER VII—CAPITAL VALUE OF THE FOREST.

229. *General.*—It is difficult to form an accurate estimate of the capital value of the forest since all of it was acquired by Government under section 16 of the Forest Act. The average annual surplus however furnishes a fairly reliable basis for calculating the capital value of a forest estate. The following statement gives the total revenue and expenditure for the period 1872–73 to 1946–47, i.e., for 74 years :—

Profit and loss statement.

Year.	*Total revenue.* RS.	*Total expenditure.* RS.	*Surplus.* RS.	*Deficit.* RS.
1872–73	16,819	13.533	3,286	
1873–74	1,18,978	13,053	5,925	..
1874–75	16,597	15 086	1,511	..
1875–76	16,602	19,759	..	3,157
1876–77	Not available.			
1877–78	23,733	22,199	15,534	..
1878–79	25,751	26,697	..	946
1879–80	21,834	31·023	..	9,189
1880–81	Not available.			
1881–82	24,132	27,088	..	2,956
1882–83	35,639	25,219	10,420	..
1883–84	36,912	41,567	..	4,655
1884–85	44,002	39,857	4,145	..
1885–86	40,119	35,436	4,683	..
1886–87	54,573	46,881	7,692	..
1887–88	56,794	45,996	10,798	..
1888–89	63,372	47,682	15,690	..
1889–90	79,660	51,625	28,035	..
1890–91	81,457	52,223	29,234	..
1891–92	84,717	51,165	33,552	..
1892–93	96,462	99,993	..	3,531
1893–94	85,486	68,757	16,729	..
1894–95	89,344	74,963	14,381	..
1895–96	89,024	62,916	26,108	..
1896–97	87,670	53,168	34,502	..
1897–98	81,126	62,375	18,751	..
1898–99	95,968	63,012	32,956	..
1899–00	84,473	54,891	29,582	..
1900–01	74,002	49,342	24,660	..
1901–02	78,548	55,664	22,884	..
1902–03	74,736	55,377	19,359	..
1903–04	1,08,822	50,998	57.824	..
1904–05	1,14,033	54,120	59,913	..
1905–06	94,931	56,889	38,042	..
1906–07	1,11,741	59,069	52,672	..
1907–08	1,20,579	55,138	65,441	..
1908–09	1,38,397	62,546	75,851	..
1909–10	1,51,807	70,846	80,961	..
1910–11	1,41,053	69,642	71,411	..

Year.	*Total revfnue.*	*Total expendi-ture.*	*Surplus.*	*Deficit.*
	RS.	RS.	RS.	RS.
1911–12	1,33,885	76,921	56,964	..
1912–13	1,36,612	66,095	70,517	..
1913–14	1,40,296	69,787	90,509	..
1914–15	1,19,902	76,831	43,071	..
1915–16	1,24,924	71,060	53,864	..
1916–17	1,45,364	62,257	83,107	..
1917–18	1,49,939	67,708	83,231	..
1918–19	1,54,309	70,413	83,896	..
1919–20	1,84,559	75,381	1,09,178	..
1920–21	1,64,901	66,521	98,380	..
1921–22	2,05,417	1,08,667	96,750	..
1922–23	2,34,714	90,925	1,43,789	..
1923–24	2,24,189	1,07,272	1,16,917	..
1924–25	2,07,533	96,598	1,10,935	..
1925–26	2,40,010	1,00,447	1,39,563	..
1926–27	1,80,857	92,926	87,931	..
1927–28	1,71,032	91,778	79,254	..
1928–29	1,54,946	93,193	61,753	..
1929–30	1,66,419	83,169	63,250	..
1930–31	1,62,511	83,843	78,668	..
1931–32	1,17,367	73,343	44,024	..
1932–33	..	..	..	..
1933–34	..	..	..	..
1934–35	1,27,719	70,181	53,538	..
1935–36	1,30,425	82,048	48,377	..
1936–37	1,23,239	76,039	47,200	..
1937–38	1,38,517	77,861	60,656	..
1938–39	1,55,899	85,622	70,277	..
1939–40	1,45,053	80,118	64,935	..
1940–41	1,46,387	72,714	73,673	..
1941–42	1,69,454	78,428	91,026	..
1942–43	3,08,060	1,44,913	1,63,147	..
1943–44	31,88,318	13,00,648	18,87,670	..
1944–45	38,72,228	15,26,793	23,45,406	..
1945–46	7,50,228	1,27,574	6,22,654	..
1946–47	5,26,936	1,28,186	3,98,750	—

The net annual surplus for 13 years amounts to Rs. 59,27,309 or an average annual surplus of Rs. 4,55,946 exclusive of interest charges. According to the basis worked out in the original plan the capital value of the forest estate may amount to Rs. 1,51,98,200, Rs. 58·35 per acre.

PART II.

Future management discussed and prescribed.

CHAPTER I—BASIS OF PROPOSALS.

SECTION 1.—GENERAL OBJECTS OF MANAGEMENT.

230. The objects of management naturally vary with each working circle but the general principles involved may be stated as follows :—

(i) To exploit with due regard to silvicultural principles the resources of the forest in sandalwood, timber, firewood and minor forest produce.

(ii) To regulate the supply of firewood and small timber with particular reference to the requirements of villages and towns in the vicinity of the forests.

(iii) To provide, conformably with established principles of conservancy for the pastoral needs of the population.

(iv) To protect the catchment areas of all the important streams and rivers on which the irrigation of the plains of the division depends.

(v) To maintain the forest in a state of increasing productivity.

(vi) To produce the maximum financial return per acre of forest.

(vii) To realize the climatological value of forest cover.

SECTION 2.—METHOD OF TREATMENT.

231. The details of the method of treatment are elaborated under each working circle. Generally exploitation will be on the basis of area, restocking being dependant on natural regeneration from coppice and seedling growth in the annual coupe. The methods of treatment to be adopted are :—

(i) division of the exploitable deciduous forest into two working circles, both to be worked under the simple coppice system, one set apart mainly for the production of fuel and the other for the production of small timber and fuel.

(ii) introduction of teak on a modest scale in suitable areas of the Ambasamudram and Kuttalam Ranges and silvicultural treatment to the existing teak plantations.

(iii) the systematic extraction of dead sandal in the sandal areas of the Srivilliputtur Range together with the tending of the growing stock where necessary and the introduction of sandal by the method of "*propagation centres*" in suitable areas outside the fuel working circles where sandal is not present.

(iv) the provision for the disposal of minor forest produce.

(v) the supply of grazing facilities to the ryots under the permit system.

(vi) afforestation operations in the Kudiraimoliteri reserve.

(vii) protection of the forests of the division from fire by a system of fire lines.

232. The method of exploitation of the forest is through the agency of contractors except for sandal woodwhich will be extracted departmentally.

SECTION 3.—WORKING CIRCLES, THEIR AREA AND DISTRIBUTION REASONS FOR THEIR FORMATION.

233. In pursuance of the objects of management set forth above, seven working circles have been formed. Each is discussed at length in the following pages.

234. So far as the Evergreen Timber Working Circle of Mr. Lasrado's Working Plan is concerned all the coupes prescribed for felling have been worked in the past. Actually felling has by no means been restricted either to the girth classes prescribed by Mr. Lasrado or even to the areas specified by him, in order to meet the demand of the defence services for timber. There are now, therefore, very few trees that will be available for extraction for some years to come. In the circumstances, it was suggested that the Evergreen T mber Working Circle be given rest for the period of this plan. The Chief Conservator, however, in his No. 13943/47-C2, dated 14th May 1948, observed on the Reconnaissance report that the desirability of working of the balance areas in types A and B should be examined and considered. After detailed investigation, it was found that all the *exploitable shola areas* have been included in the Evergreen Working Circle under Mr. Lasrado's plan, exploitability being determined by the presence of four or more mature trees per acre and further limited by the existence of extraction facilities and the possibility of constructing cheap extraction tracks within the areas. A portion of the area classified in Mr. Lasrado's plan as type 'B' was included under the clear felling working circle. The remaining areas wherever accessible, though considered unfit for selection felling, were heavily worked during the war years or supply of timber for defence purposes and there are, therefore, no more trees of exploitable size and species now. The areas that lie beyond the limit of Mr. Lasrado's Evergreen Working Circle are really inaccessible and the construction of roads to tap these areas will entail expenditure altogether incommensurate with the produce to be obtained. It is therefore considered that this working circle should be given rest during the period of this plan.

The Clear-felling Working Circle of Mr. Lasrado's plan has been renamed " The Regeneration Working Circle " as being more appropriate.

235. The following statement shows the distribution of the several working circles :—

Serial No.	Working Circle. Name.	Working Circle. Extent.	Range.	Distribution. (Reserves included.)	Number of felling series in the circle.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		ACS.				
1	Timber-*cum*-fuel ..	21,540	Nanguneri, Ambasamudram, Kuttalam, Srivilliputtur.	All exploitable deciduous forests containing small timber.	6	
2	Fuel ..	45,410	Do.	All exploitable deciduous forests containing fuel.	22	
3	Regeneration ..	450	Kuttalam, Ambasamudram.	Papanasam-Alwarkurichi Reserved Forest, Kuttalam Reserved Forest and Vadagarai Reserved Forest.	2	
4	Sandal ..	4,742	Kuttalam, Srivilliputtur.	Kuttalam, Srivilliputtur Reserved Forest.	1	
5	Minor Forest produce.	Whole division.	Nanguneri, Ambasamudram, Kuttalam and Srivilliputtur.	All reserves.		
6	Grazing	1,26,751	Do.	Do.	..	Except closed areas.
7	Afforestation ..	12,772	Nanguneri	Kudiraimoliseri ..	..	

SECTION 4.—PERIOD OF THE WORKING PLAN.

236. This plan will be in force for fifteen years from 1st April 1949 to 31st March 1964. The field work relating to revision should be undertaken two years before the expiry of the plan so that there might be no break in the continuity of controlled working.

CHAPTER II—WORKING PLAN FOR THE TIMBER-*CUM*-FUEL WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE CIRCLE AND CHARACTER OF THE VEGETATION.

237. *Area.*—The area of the working circle is 21,540 acres which lie distributed over the four ranges of the division.

238. *Constitution.*—It includes all the former " coppice with standard " felling series, which are considered capable of producing small timber on an economic rotation. It however excludes the six annual Teak plantations formed in Ayyanar koil series between 1938 and 1943.

239. The working circle includes the best deciduous forests of the division, where the rainfall and soil conditions are most suitable for the predominant species, Teak. The principal associates are *Pterocarpus marsupium*, *Anogeissus latifolia*, *Grewia spp*, *Bauhinia spp. and Dalbergia latifolia.* Where, however, there is heavier rainfall as in the Kuttalam felling series evergreens such as *Eugenia spp.* *Diospyros spp.* and *Aglaia spp.* are present. In other localities again, e.g., Kalakad, Padarmalai and Koilteri felling series previous working on a short rotation together with recurrent fires have resulted in the teak being now stunted. Lastly, where abandoned cultivation was included at the time of reservation as in the Puliangudi felling series grasses, *Acacia latronum* and *Dichrostachys cinerea* are found.

SECTION 2.—DIVISION OF THE AREA.

240. *Felling series.*—The working circle has been divided into six felling series as follows :—

Serial number and name of felling series. (1)	*Name of Range.* (2)	*Area in acres.* (3)
1 Ayyanarkoil	Srivilliputtur	5,260
2 Puliangudi	Kuttalam	2,960
3 Kuttalam	Do.	2,000
4 Koilteri	Ambasamudram	3,160
5 Padarmalai	Do.	4,380
6 Kalakad	Nanguneri	3,780

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

241. *Valuation of the crop.*—During the period of the war, the prices of both fuel and small timber went up and due to the heavy demand, these coupes were worked in advance with the result that fellings have been pushed forward one to four years. The lack of homegeneity in the growing stock and the varying rate of growth of each species according to the nature of the soil and the rainfall render the task of accurately estimating the average yield per acre. For these reasons detailed enumeration or valuation surveys were not made.

SECTION 4.—METHOD OF TREATMENT.

242. *Silvicultural system.*—The forest will be worked under the system of " simple coppice."

243. *Rotation.*—A rotation of 40 years is prescribed.

244. *Regulation of the yield.*—The yield is regulated by area. In each felling series, therefore, the size of the annual coupe is obtained by dividing the total area by the period of the rotation. In the laying out of the annual coupe, natural features have been followed as far as possible.

SECTION 5.—METHOD OF EXECUTING FELLINGS.

245. *The annual coupe and its lay out.*—The annual coupe will be demarcated on the ground in accordance with the management maps, by cut lines 10 feet wide except where the boundary is already well defined, by natural features. Any new cut lines will be included in the area of the coupe and the lessee of the coupe will be entitled to the produce obtained from such lines. The correct area of the coupe will be computed from actual survey, which must be done by an officer not below the rank of Range Officer, who will certify to the correctness of the survey. Such surveys will be completed by the Range

Officers not later than September of the year previous to that in which the coupes are to be sold. The necessity for the District Forest Officer checking coupe surveys is emphasised, as inaccurate surveys may involve loss of revenue to Government. In view of the heavy exploitation that has taken place during the war years, it is prescribed that the District Forest Officer or his Gazetted Assistant should check 25 per cent of such surveys and record the fact in the sale papers concerned.

246. *Division into strips.*—Each coupe will be divided into not less than two strips by cut lines 6 feet wide running across the contours. In cases where the greater length of the coupe runs across the contours this rule may be relaxed.

247. *Agency of felling.*—The coupe will be sold in public auction by the District Forest Officer in January of the year in which it is to be worked so as to provide sufficient time for the disposal of the coupes by tender, should prices obtained at the sale prove unacceptable. The felling will be carried out through the agency of contractors.

The coupe will be conveyed to the lessee on the 1st of April, a voidah of 12 months being allowed. Coupes unsold in time or leased subsequently on tender, should not ordinarily have an extension of voidah beyond the 31st of the following March. Range Officers should ensure by frequent inspection that the work of felling and removal is being effected at such a rate, that felling and removal will be completed within the lease period. Extension of voidah will not be allowed.

248. *Coupe arrears.*—Any portion of the annual coupe left unworked by the contractor after the termination of the period of his contract, will be surveyed by the Range Officer within a month and the area computed. The District Forest Officer will put the arrear area for sale by auction within a month after it has been surveyed.

249. *Reserved species.*—All sandal, tamarind, *Terminalia chabula*, bamboo, *palmyra* and *Bombax malabaricum* in the annual coupe shall be reserved. The retention of these species is prescribed because, they are not regular fuel yielding species and their value as timber of minor forest produce yielding trees is much greater than their fuel value. The District Forest Officer may, after inspection, authorize the felling of aged, crooked or otherwise unsound trees of reserved species except sandal, but power to do this must be reserved in any minor forest produce lease that may be affected. In the case of tamarind trees so felled, root wounding around the stump will be done by the contractor as it has been found experimentally that such treatment usually yields a crop of root suckers. Other species may be added to the list by the District Forest Officer subject to the approval of the territorial Conservator, but the number should be limited as far as possible so as to avoid unnecessary interference with the contractor.

To ensure that this prescription is carried out, the Range Officer shall be required to enumerate such reserved species and submit a list to the District Forest Officer before the sale is held. This list shall be checked and certified to in the coupe completion report submitted by the Ranger at the end of the lease period.

250. *Felling rules.*—Felling should proceed in a systematic manner strip by strip.

The contractor need not cut Euphorbias or other useless species unless he wishes to. Everything that the contractor cut shall be felled flush with the ground.

All strobilanthes in the annual coupe will be cut at ground level below the proper stilt roots, heaped in patches over the area and burnt by the lessee. The eradication of this weed is a matter of the first importance and the result of annual operations should invariably be recorded in the control journal.

Lantana wherever it occurs in the annual coupe shall be up-rooted by the lessee.

251. *Coppicing.*—It is necessary to insist on any elaborate or particular method of trimming the Stool. All that is required is that the cut be close to the ground and the bark be not separated from the wood. A sloping cut with one side at ground level and the other not more than 6 inches above it, is perhaps the best. The use of sharp axes and bill-hooks should be insisted upon by frequent inspection.

252. *Disposal of felled material.*—All felling shall be done by the contractors' coolies and the contractor or his duly authorized agent shall be present in the coupe whenever felling or removals are in progress. All fuel billets shall be *stacked*. A stack measuring 5 feet by 4 feet by $2\frac{1}{2}$ feet (50 stacked cubic feet) will be adopted. Removals of fuel below 6 inches girth on head load permits will be permitted without prior stacking but such permits will be issued only inside the coupe itself. All timber shall, on felling and conversion, be hammer-marked by the local beat guard before removal, and he will submit in his weekly diary an account of such timber classified according to species in units. A monthly abstract of the guards' account shall be prepared in the Range Office and submitted to the District Forest Officer by the first of the succeeding month.

SECTION 6.—TABULAR STATEMENT OF FELLINGS.

253. *Timber-cum-fuel felling series.*—

Year of working.	*Coupe number.*	*Srivilluputtur.*	*Kuttalam.*		*Ambasamudram.*		*Nanguneri.*
		Ayyanarkoil series.	*Puliamgudi.*	*Kuttalam series.*	*Koilteri series.*	*Padarmalai series.*	*Kalakad series.*
		ACS.	ACS.	ACS.	ACS.	ACS.	ACS.
1949–50	I	140	78	27	60	95	80
1950–51	II	140	70	27	60	120	80
1951–52	III	155	78	27	60	100	100
1952–53	IV	155	78	31	70	90	90
1953–54	V	130	70	33	60	110	90
1954–55	VI	155	70	27	70	130	90
1955–56	VII	130	70	34	70	100	90
1956–57	VIII	130	66	33	80	110	95
1957–58	IX	135	78	27	70	93	95
1958–59	X	135	60	33	70	110	95
1959–60	XI	155	65	34	80	110	80
1960–61	XII	160	70	27	80	110	80
1961–62	XIII	135	78	34	65	90	85
1962–63	XIV	155	65	34	90	100	90
1963–64	XV	156	60	34	80	90	85
1964–65	XVI	156	80	27	90	90	80
1965–66	XVII	141	80	33	90	100	90
1966–67	XVIII	146	80	31	80	102	90
1967–68	XIX	131	70	27	80	102	80
1968–69	XX	141	80	27	80	101	85
1969–70	XXI	146	70	27	90	102	90
1970–71	XXII	141	60	27	86	103	85
1971–72	XXIII	141	80	25	80	129	90
1972–73	XXIV	120	80	27	80	91	103
1973–74	XXV	119	106	28	70	101	108
1974–75	XXVI	148	83	27	86	100	94
1975–76	XXVII	127	73	27	84	75	92
1976–77	XXVIII	142	72	27	80	72	97
1977–78	XXIX	150	75	34	79	75	108
1978–79	XXX	115	71	27	64	105	100
1979–80	XXXI	109	75	34	70	101	107
1980–81	XXXII	118	66	34	70	104	103
1981–82	XXXIII	128	87	25	70	74	107
1982–83	XXXIV	91	70	27	70	102	75
1983–84	XXXV	92	63	27	73	111	102
1984–85	XXXVI	91	70	34	86	112	69
1985–86	XXXVII	115	54	33	86	61	102
1986–87	XXXVIII	123	64	32	79	66	119
1987–88	XXXIX	115	95	28	87	68	127
1988–89	XL	48	100	33	85	72	137
	Total ..	5,260	2,960	728 plus 310 teak plantation.	3,060	3,874 plus 506 upper dam enclosure.	3,780

SECTION 7.—MISCELLANEOUS REGULATIONS.

254. *Artificial regeneration.*—In Kuttalam timber-*cum*-fuel series, suitable areas for Kumri cultivation may be selected in the annual coupes, the extent of the area to be regenerated depending on the availability of the Kumridars. The results achieved in the past years are encouraging.

255. *Demarcation.*—Four salient corners of the annual coupe will be demarcated with cut stone slabs, showing the coupe number, the year of working, as well as the adjacent coupe number and its year of working.

256. *Grazing.*—Felled coupes will be closed to grazing for a period of 5 years including the year of felling. In order to facilitate the taking of cattle through closed coupes the District Forest Officer will provide fenced paths or " Corridors " at the expense of the Government where necessary. When a coupe is closed to grazing the coupe stones will be clearly painted with a red band 3 inches wide running across the centre of the stone horizontally and maintained with fresh till the coupe is thrown open to grazing.

257. *Fire protection.*—No special measures for fire protection within the working circle are advocated, as past experience has shown that such measures are not justified by the expense involved. The regid closure of such areas as are burnt after a big fire has occurred is essential to allow of the recovery of the area and must be enforced. To be of effect such closure must follow immediately on the fire. The procedure to be adopted is detailed under the prescription for the Grazing Working Circle.

258. *Supply of agricultural implements.*—The contractor shall in the coupe on demand by any ryot sell timber for the manufacture of bona fide agricultural implement at prices fixed by the District Forest Officer. This condition shall find a place in the sale notices as well as in the agreements of the coupe concerned.

259. *Charcoal burning.*—Charcoal burning will be permitted on request by the contractor in all the annual coupes. Not more than 2 pits will be permitted on any one acre. The contractor will be required to clear all inflammable material for a radius of 30 feet around each pit, and will be liable to forfeit his security deposit in case his carelessness in this respect causes a fire within the annual coupes.

260. *Illicit fellings.*—The contractor will also be held responsible for all illicit fellings which occur within 10 chains of the boundary of the area leased out to him.

261. *Record of statistics.*—The contractor will be required to furnish monthly statements of removals of fuel and small timber to the Range Officer not later than the 25th of each month, showing the number of stacks or cart-loads of fuel removed, the quantity sold on head-load permits and species and volume of timber extracted in cubic feet. The Range Officer will send an abstract of these accounts for each coupe or other lease to the District Forest Officer within one month of the termination of each lease.

Control book.—The following conversion factors will be adopted :—

28 bags charcoal (80 lb. each).	1 ton charcoal.
1 ton charcoal.	5 tons fuel.
125 stacked c.ft. fuel.	1 ton fuel.
40 c.ft. timber.	1 ton timber.
40 head-loads fuel.	1 ton fuel.

Should the contractor fail to submit his statements in time, his work shall be stopped forthwith by the Range Officer who will immediately apprise the District Forest Officer of his action by a special report.

262. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) Control book,
(*b*) Record of works,
(*c*) Control journal for the working circle, and
(*d*) Control maps.

Control Book.—All operations actavally carried out in connexion with exploitation in each felling series will be entered in the appropriate columns.

Records or works.—All works carried out under the prescriptions or recommendation of the Working Plan as well as such measures as are neither prescribed nor suggested but are carried out, will be recorded in this form.

Control journal.—It is emphasised that useful observations made in the field are clearly and fully recorded in the journal since the existing one contains meagre details. The journal will be written up by the District Forest Officer himself or his gazetted assistant.

Control maps.—Maintenance of the Control Map is emphasised as it was not properly done in the past.

CHAPTER III—WORKING PLAN FOR THE FUEL WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

263. *Area.*—The area of the working circle is 45,410 acres which lie distributed over the four ranges of the division.

264. *Constitution.*—It includes all the former coppice with standard felling series which are considered capable of producing mainly fuel and incidentally some small timber on an economic rotation.

265. *Character of the vegetation.*—The following types of vegetation may be recognized :—

(*a*) Where both rainfall and soil conditions are conducive to the development of only the more *xerophytic species* ; *Dalbergia multiflora, Dischrostachys cinerea, Dolichandrone crispa, Zizyphus species, Randia species* and *Acacia leucophloea* are the principal species to be found. The undergrowth consists mainly of *Dodonea viscosa, Cassia auriculata* and grass. A characteristic example of this type is the Rangarkoil felling series in Srivilliputtur Range and the Kolundumamalai and Vallanad felling series in Nanguneri Range. Here the height growth of the forests is generally below 15 feet and the fuel yield per acre averages to 2 to 3 tons ;

(*b*) where rainfall and soil conditions are more favourable, a better type of vegetation results. The principal species are *Albizzia amara* and *lebbek, Acacia leucophloea* and *ferruginea, Randia species, Zizyphus species,* the under growth consisting mainly *strobilanthus* and grass. The Valaikulam felling series in Srivilliputtur Range and a few coupes of Karuppaswamikoil felling series of Kuttalam Range are characteristic examples ;

(*c*) the bulk of the forest on the outer slopes of the ghats form the third type which consists of a degraded form of type III described under Part I caused mainly by the combined effects of over-grazing and recurrent fires ;

(*d*) patches of semi-deciduous forest containing principally *Aglaia species, Diospyros species, Vitex altissima, Holoptelia integrifolia, Pongamia glabra, Pterospermum rubiginosum* and *Glabrescens, Cordia myxa*, etc., have also been included in some of the felling series of this working circle where it was considered that such patches were too small in extent to be constituted into a separate working circle and where the factors of the locality were not considered conducive to the development of small timber on an economic rotation. Such areas occur in the Sivasailam felling series of Ambasamudram Range and Tirukkurangudi felling series of Nanguneri Range.

SECTION 2.—DIVISION OF THE AREA.

266. *Felling series.*—This working circle has been divided into 22 felling series as follows :—

Range.	Serial number of felling series and name of felling series.	Area in acres.
Srivilliputtur	1 Unnipathimalai	1,630
	2 Pudupatti	2,660
	3 Rangarkoil	2,280
	4 Alagarkoil	2,180
	5 Valaikulam	1,530
Kuttalam	6 Vasudevanallur	3,120
	7 Karuppaswamikoil	3,000
	8 Kadayanallur	2,540
	9 Chinnakadu	1,640
	10 Mathalamparai	2,100
Ambasamudram	11 Govindaperi	1,660
	12 Sivasailam	2,600
	13 Ambur	1,960
	14 Koriar	1,660
Nanguneri	15 Kolundumamalai	1,270
	16 Padmaneri	1,800
	17 Vadagarai	2,230
	18 Malandipudur	880
	19 Nambikoil	1,800
	20 Tirukkurangudi	1,610
	21 Parivarisuriyan	2,060
	22 Vallanad	3,200

The division into felling series have been dictated by the necessity for following the existing divisions as far as possible.

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

267. With the exception of suitable areas of virgin forest added to the various felling series wherever such a step was considered advisable, most of the felling series of the working circle consist of a series of age gradations from one year to a maximum of 30 years worked either under the " simple coppice " or " coppice with standard " system in the past. During the period of the war, the price of fuel went up and due to heavy demand these coupes were worked in advance with the result that fellings have been pushed forward by one to four years. The lack of homogeneity in the growing stock and the varying rate of growth of each species according to the nature of the soil and the rainfall render the task of accurately estimating the average yield per acre at maturity highly problematical. For these reasons, detailed enumeration or valuation surveys were not made.

SECTION 4.—METHOD OF TREATMENT.

268. *Silvicultural system.*—The working circle will be worked under the system of " simple coppice."

269. *Rotation.*—A rotation of 30 years is prescribed.

270. *Regulation of the yield.*—The yield is regulated by area in each felling series, therefore, the size of the annual coupe is obtained by dividing the total area by the period of the rotation. In the laying out of the annual coupe natural features have been foll wed as far as possible.

SECTION 5.—METHOD OF EXECUTING FELLINGS.

271. *The annual coupe and its lay out.*—The annual coupe will be demarcated on the ground in accordance with the felling series map, by cut lines 10 feet wide except where the boundary is already well defined, by natural features. Any new cut lines will be included in the area of the coupe and the lessee of the coupe will be entitled to the produce obtained from such cutting. The correct area of the coupe will be computed from actual survey which may be done by an officer not below the rank of the Forester but to be countersigned by the Range Officer who will certify to the correctness of the survey. The necessity for the District Forest Officer's checking coupe surveys is emphasized, as inaccurate surveys may involve loss of revenue to the department. In view of the heavy exploitation that has taken place during the war years, it is prescribed that the District Forest Officer or his gazetted assistant should check at least 25 per cent of such surveys and record the fact with the sale papers concerned and in the control book.

272. *Division into strips.*—Each coupe will be divided into not less than two strips by cut lines 6 feet wide running across the contours. In cases where the greater length of the coupe runs across the contours, this rule may be relaxed and the strip lines made to run along the contours, if considerable economy in cutting of strip lines result thereby. In such a case the most elevated strip should be worked first. All annual coupe surveys will be completed by Range Officers by the end of September of the year previous to that in which the coupe is to be sold.

273. *Period of lease and agency of exploitation.*—The coupe shall be sold in public auction every year and conveyed to the respective lessees on the first of April. A voidah of 12 months will be allowed for each coupe. The lease for coupes left unsold in the general sale, but sold subsequently in special sales, should expire as if they had been sold normally. Extension of voidah beyond 31st of March of the following year will not be allowed. The Range Officers should ensure by frequent inspections that the work of felling and removal is being effected at such a rate that these operations will be completed by the end of the period of contract.

274. *Coupe arrears.*—In the event of any portion of a coupe remaining unfelled at the close of the period of lease, such portion will be surveyed, area computed, and sold in public auction as soon as possible after survey, allowing the lease period to the minimum requirement with reference to the extent of the arrear area at the discretion of the District Forest Officer. In cases, however, where the District Forest Officer is satisfied that the arrear area contains very poor growth or is very difficult to work or is for any other reasons inexpedient to clearfell the arrear area need not be sold. In such cases, the reasons for not working the arrear area should be recorded in the control journal and a suitable remark made in the control book.

275. *Felling rules.*—(1) The coupe will befelled in a systematic manner strip by strip.

(2) Felling will be confined to the trees which the contractor wishes to remove. But he should not fell sandal and other important minor forest produce species reserved. The prescriptions contained in paragraph 249 regarding the enumeration of reserved trees, etc., shall be followed.

(3) The trees will be felled as close to the ground as possible, and it should be seen that the bark of the stem is not torn.

276. *Disposal of felled materials.*—Felling and removal of produce from a coupe will be completed before the end of the lease period. The contractor will stack all cut wood prior to removal, the size of the stacks to be fixed by the District Forest Officer. This need not be insisted on in cases where the cut produce is converted into charcoal. If the contractor wishes to remove timber or posts from the coupes, he may do so, but he should not remove them from the stump site till they have been checked and hammer marked by the beat guard.

Section 6.—Tabular Statement of Fellings.

277. *Fuel felling series*—

Year of working.	Coupe number.	*Srivilliputtur Range.* *Unnipathimalai series.*	*Pudupatti series.*	*Rangarkoil series.*	*Alagarkoil series.*	*Valaikulam series.*
		ACS.	ACS.	ACS.	ACS.	ACS.
1949–50	I	60	120	80	75	50
1950–51	II	65	120	80	100	60
1951–52	III	60	121	90	90	60
1952–53	IV	60	80	90	90	50
1953–54	V	60	90	95	100	50
1954–55	VI	50	110	100	90	40
1955–56	VII	50	90	95	80	40
1956–57	VIII	60	90	95	80	45
1957–58	IX	60	100	90	80	45
1958–59	X	60	110	90	80	45
1959–60	XI	60	110	90	75	45
1960–61	XII	48	110	85	85	45
1961–62	XIII	48	110	90	75	45
1962–63	XIV	47	110	90	67	45
1963–64	XV	54	74	61	67	54
1964–65	XVI	55	77	61	65	52
1965–66	XVII	59	76	72	72	54
1966–67	XVIII	52	84	68	61	53
1967–68	XIX	54	81	60	65	49
1968–69	XX	53	76	65	72	50
1969–70	XXI	56	76	58	69	53
1970–71	XXII	40	78	72	59	59
1971–72	XXIII	69	97	66	82	54
1972–73	XXIV	53	75	67	91	51
1973–74	XXV	42	37	50	64	66
1974–75	XXVI	47	57	49	70	53
1975–76	XXVII	52	78	56	72	48
1976–77	XXVIII	42	50	67	43	70
1977–78	XXIX	64	98	85	83	48
1978–79	XXX	50	75	63	58	55
	Total ..	1,630	2,660	2,280	2,260	1,520

Fuel felling series—cont.

Year of working.	Coupe number.	Kuttalam Range. Vasudevanallur series.	Karuppaswamikoil series.	Kadayanallur series.	Chinnakadu series.	Mathalamparai series.
		ACS.	ACS.	ACS.	ACS.	ACS.
1949–50	I	160	120	100	70	70
1950–51	II	126	120	110	60	60
1951–52	III	105	100	94	70	70
1952–53	IV	126	100	104	60	70
1953–54	V	126	90	94	80	70
1954–55	VI	126	102	100	60	70
1955–56	VII	120	122	100	70	75
1956–57	VIII	126	122	100	61	80
1957–58	IX	125	140	110	80	70
1958–59	X	140	130	95	85	75
1959–60	XI	140	120	94	55	75
1960–61	XII	126	130	94	61	70
1961–62	XIII	110	140	94	55	70
1962–63	XIV	128	140	90	61	67
1963–64	XV	96	106	66	43	109
1964–65	XVI	93	83	64	57	58
1965–66	XVII	105	73	82	48	112
1966–67	XVIII	103	72	83	48	76
1967–68	XIX	136	75	71	52	72
1968–69	XX	102	71	70	45	79
1969–70	XXI	117	75	79	47	73
1970–71	XXII	101	66	53	43	75
1971–72	XXIII	105	87	72	43	61
1972–73	XXIV	81	70	66	46	69
1973–74	XXV	33	63	70	29	50
1974–75	XXVI	50	70	80	35	50
1975–76	XXVII	47	54	67	41	50
1976–77	XXVIII	36	64	54	31	46
1977–78	XXIX	54	95	67	76	57
1978–79	XXX	127	100	62	58	45
	Total ..	3,120	3,000	2,484	1,640	2,100

Fuel felling series—cont.

Year of working.	Coupe number.	Ambasamudram Range. Govindaperi series.	Sivasailam series.	Ambur series.	Koriar series.
		ACS.	ACS.	ACS.	ACS.
1949–50	I	55	130	65	55
1950–51	II	55	130	65	55
1951–52	III	55	120	65	55
1952–53	IV	55	120	65	55
1953–54	V	55	120	65	70
1954–55	VI	55	120	70	81
1955–56	VII	55	105	70	70
1956–57	VIII	60	105	60	60
1957–58	IX	60	105	60	60
1958–59	X	60	120	60	60
1959–60	XI	60	105	60	60
1960–61	XII	60	90	70	55
1961–62	XIII	60	95	41	54
1962–63	XIV	60	82	42	51
1963–64	XV	46	63	45	52
1964–65	XVI	50	78	70	52
1965–66	XVII	51	70	63	52
1966–67	XVIII	46	74	63	57
1967–68	XIX	51	65	70	52
1968–69	XX	45	75	71	54
1969–70	XXI	47	73	74	50
1970–71	XXII	50	101	69	48
1971–72	XXIII	53	73	65	47
1972–73	XXIV	39	82	66	46
1973–74	XXV	34	36	85	53
1974–75	XXVI	38	41	66	51
1975–76	XXVII	38	30	83	67
1976–77	XXVIII	48	49	67	50
1977–78	XXIX	42	53	47	44
1978–79	XXX	77	90	88	44
	Total ..	1,560	2,600	1,950	1,660

Fuel felling series—cont.

Year of working.	Coupe number.	Nanguneri Range. Kolunduma-malai series.	Nanguneri Range. Padmaneri series.	Nanguneri Range. Vadagarai series.	Nanguneri Range. Malayadi-pudur series.
(1)	(2)	(3)	(4)	(5)	(6)
		ACS.	ACS.	ACS.	ACS.
1949–50	I	45	70	90	37
1950–51	II	45	70	80	43
1951–52	III	50	70	80	38
1952–53	IV	55	65	80	33
1953–54	V	55	60	80	44
1954–55	VI	60	60	80	44
1955–56	VII	65	60	80	44
1956–57	VIII	45	65	80	44
1957–58	IX	45	65	80	34
1958–59	X	55	60	80	34
1959–60	XI	50	60	75	44
1960–61	XII	55	60	74	44
1961–62	XIII	55	65	75	34
1962–63	XIV	37	63	79	20
1963–64	XV	33	54	75	17
1964–65	XVI	43	62	68	19
1965–66	XVII	42	39	73	20
1966–67	XVIII	40	45	85	19
1967–68	XIX	42	57	79	22
1968–69	XX	36	61	66	19
1969–70	XXI	46	58	78	20
1970–71	XXII	46	57	70	22
1971–72	XXIII	43	43	71	19
1972–73	XXIV	43	60	53	18
1973–74	XXV	32	44	46	25
1974–75	XXVI	42	52	53	18
1975–76	XXVII	41	52	52	24
1976–77	XXVIII	40	48	48	27
1977–78	XXIX	31	88	67	26
1978–79	XXX	58	77	83	28
	Total ..	1,375	1,790 plus 90 unallotted.	2,180	880

Fuel felling series—cont.

Year of working.	Coupe number.	Nanguneri Range—cont. Nambikoil series.	Nanguneri Range—cont. Tirukuran-gudi series.	Nanguneri Range—cont. Parivari-suriyan series.	Nanguneri Range—cont. Vallanat series.
		(7)	(8)	(9)	(10)
		ACS.	ACS.	ACS.	ACS.
1949–50	I	65	54	80*	145
1950–51	II	65	54	60	145
1951–52	III	60	54	70	140
1952–53	IV	60	54	70	115
1953–54	V	50	51	80	135
1954–55	VI	60	51	80	135
1955–56	VII	60	51	45	145
1956–57	VIII	58	51	60	115
1957–58	IX	50	49	75	135
1958–59	X	58	51	60	115
1959–60	XI	58	51	60	135
1960–61	XII	58	51	80	135
1961–62	XIII	58	51	80	136
1962–63	XIV	58	49	42	68
1963–64	XV	50	49	45	85
1964–65	XVI	58	56	61	101
1965–66	XVII	58	43	47	88
1966–67	XVIII	18	48	46	92
1967–68	XIX	66	50	45	89
1968–69	XX	73	59	48	100
1969–70	XXI	60	46	54	94
1970–71	XXII	73	62	55	105
1971–72	XXIII	70	55	51	102
1972–73	XXIV	64	56	64	102
1973–74	XXV	63	51	66	57
1974–75	XXVI	64	50	39	55
1975–76	XXVII	64	50	66	73
1976–77	XXVIII	76	77	42	75
1977–78	XXIX	53	56	74	82
1978–79	XXX	72	81	69	101
	Total ..	1,800	1,610	1,805 plus 255 excluded.	3,200

* The actual area is 83·6 acres—Deviation sanctioned in C.C.F. Rt. No. 1048/50, dated 30th September 1950 (T. No. 765/50).

SECTION 7.—MISCELLANEOUS REGULATIONS.

278. *Demarcation.*—Four salient corners of the annual coupe will be demarcated with cut stone slabs, showing the coupe number, the year of working, as well as the adjacent coupe number and its year of working.

279. *Grazing.*—Felled coupes will be closed for a period of five years inclusive of the year of felling, but the District Forest Officer will be permitted to open them as soon as he considers that there is enough grass and close them after a short period when the grass has been consumed by specially licensed cattle. Easy access to grazing grounds beyond closed coupes must be given. If coupe lines are suitable, ways through coupes must be allowed and some expenditure on fencing either side of the track must be fenced if necessary. Closed areas must be distinguished on the ground by clearly painting the coupe stones with a red band 3 inches wide running across the centre of the stone horizontally and maintained with fresh paint till the coupe is thrown open to grazing.

280. *Fire protection.*—No special measures of fire protection are necessary. The rigid closure of such areas as are burnt after a big fire has occurred is essential for the recovery of the area and must be enforced. To be of effect, such closure must follow immediately on the fire. The procedure to be adopted is detailed under the prescriptions for the grazing working circle.

281. *Agricultural implements.*—The contractor will be required under agreement to supply agricultural implements and small timber to ryots at rates prescribed by the District Forest Officer and embodied in the lease agreements of coupes. He should, whenever possible, make enquiries in the neighbouring villages and find out whether their needs in this direction are satisfied.

282. *Retail sale of fuel by contractors.*—The contractor will also be required under the agreement to sell fuel in retail in the coupe under working to the public at rates fixed by the District Forest Officer.

283. *Charcoal burning.*—Charcoal burning may be permitted in the coupes of the regular series at the discretion of the District Forest Officer in approved sites.

284. *Record of statistics.*—The contractor will be required to furnish monthly statements of removals of firewood, charcoal, timber and leaf manure to the Range Officer not later than the 25th of each month showing the number of stacks or cart-loads of fuel removed, the quantity sold on head-load permits and species and volume of timber extracted in cubic feet. The Range Officer will send a monthly abstract of these accounts for each coupe in his range to the District Forest Officer so as to reach him by the first of the succeeding month. The total removals of fuel and timber during the year will be abstracted in the District Forest office and entered in the appropriate column of the control book. The following conversion factors will be adopted :—

28 bags of charcoal (80 lb. each)	1 ton of charcoal.
1 ton charcoal	5 tons fuel.
125 stacked cubic feet fuel	1 ton fuel.
40 cubic feet timber	1 ton of timber.
40 head-loads fuel	1 ton fuel.

285. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) Control book ;
(*b*) record of works ;
(*c*) control journal for the working circle ; and
(*d*) control maps.

Control book.—All operations actually carried out in connexion with exploitation in each felling series will be entered in the appropriate column.

Record of works.—All works carried out under the prescriptions or recommendation of the working plan as well as such measures as are neither prescribed nor suggested but are carried out, will be recorded in this form.

Control journal.—It is emphasized that useful observations made in the field are clearly and fully recorded in the journal, since the existing one contains meagre details. The journal will be written up by the District Forest Officer himself or his gazetted assistant.

Control maps.—Maintenance of control maps is emphasized since it was not properly done in the past.

CHAPTER IV—WORKING PLAN FOR THE REGENERATION WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE CIRCLE AND CHARACTER OF THE VEGETATION.

286. *Constitution.*—The working circle covers those areas in Kariar and Kalar valleys in Ambasamudram range, those in Kuttalam reserve near the forest rest-house and in Melpadagai reserved forest in Kuttalam range, which are considered suitable for artificial regeneration with teak. These areas are marked in the working plan maps. It also includes the six annual teak plantations raised between 1938 and 1943 in Ayyanarkoil series.

In addition, all the existing teak plantations in Ambasamudram and Kuttalam ranges are also included in this working circle in order that their future treatment may be adequately controlled.

287. *Character of vegetation.*—The vegetation in the areas in Ambasamudram range consists generally of good quality semi-deciduous forest, the height-growth varying from 35 to 70 feet. *Canarium strictum, Terminalia travancorensis, Eugenia sp., Chuckrassia tabularis, Anageissus latifolia, and Cordia myxa* are the common species found with the herbaceous under growths of *Solanum, Gurcuma* and *Gompositae, Helicteres isora* and *Muraya exoitica* are the common woody shrubs. The areas in Kuttalam range contain good coppice regrowth of teak (especially in Melpadagai), *Anageissus latifolia, Pterocarpus marsupium, Grewia sp., Albezzia lebbek* and other common fuel species found in the timber-*cum* fuel series. In the Kuttalam area an admixture of evergreens such as *Eugenia sp., Diospyros sp.* and *Aglaia sp.*, is present.

288. *Division into felling series.*—Since the areas are distributed over two ranges two felling series are formed—

	ACS.
(1) Ambasamudram Felling series	633
(2) Kuttalam Felling series	581

SECTION 2.—BLOCKS AND COMPARTMENTS.

289. *Blocks and compartments.*—No permanent blocks are necessary as the areas suitable for planting have been marked on the working plan map in four blocks and it is proposed that the area planted annually will be selected by the District Forest Officer from these blocks.

290. *Boundaries.*—All the future plantations will be of regular shape preferably square, or rectangular. The boundaries should be maintained by clearing them periodically, preferably at the time of undertaking any silvicultural operations in the plantations.

SECTION 3.—ANALYSIS AND VALUATION OF CROP.

291. The standing crop has been sold in the past for prices varying from Rs. 75 to Rs. 750 per acre—vide table below.

Ambasamudram range.				Kuttalam range.			
Year of planting.	*Locality.*	*Area in acres.*	*Rate per acre.*	*Year of planting.*	*Locality.*	*Area in acres.*	*Rate per acre.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			RS. A. P.				RS.
1936–37	Serviar	17·5	77 8 0	1945	Five Falls road.	5	420
1937–38	Do.	20·0	120 0 0	1946	Do.	5	750
1938–39	Do.	20·0	86 0 0				
1939–40	Do.	20·0	75 0 0				
1940–41	Do.	21·3	151 0 0				
1941–42	Do.	22·5	295 0 0				
1943	Do.	21·4	425 0 0				
1944	Do.	20·3	642 0 0				
1945	Kariar	22·0	500 0 0				
1946	Do.	17·0	500 0 0				
1946	Kariar valley ..	44·0	513 0 0				
1947	Do.	20·0	600 0 0				

The areas over which teak plantations were raised in Kuttalam range from 1934 to 1944 were selected from the annual coupes of Kuttalam Timber-*cum*-Fuel Felling Series; hence, the standing growth was not sold separately. It will be seen that the prices obtained during the war years were abnormally high.

SECTION 4.—METHOD OF TREATMENT.

292. *Silvicultural system.*—The silvicultural system will consist of clear felling and artificial regeneration.

293. *Choice of species.*—The species to be used in regenerating the clear felled areas will be teak.

294. *Rotation.*—The soil conditions are not conducive to the development of big timber on long rotation. Teak grows much more slowly here than in the adjacent Travancore forests. The oldest teak plantations in this division are of 1917–18 (30 years old), one in Ambasamudram range, near Kodamadi, 32 acres in extent, and the other of about one acre in Melpidagai in Kuttalam range. From measurements taken of trees in these plantations it would be seen that we can expect an average girth of 3½ feet at breast height in 40 years.

295. *The annual plantation.*—The areas allotted to the felling series are as follows :—

Range.	*Locality.*	*Area planted up to 1948–49.*	*Area available for planting.*	*Total.*
(1)	(2)	(3)	(4)	(5)
		ACS.	ACS.	ACS.
Ambasamudram	Serviar	309·75	Nil.	309·75
	Kariar	143·00	20	163·00
	Sivasailam	Nil.	160	160·00
			Total ..	632·75
Kuttalam	Near Five Falls	240·00	91	331·00
	Melpidagai	Nil.	250·00	250·00
			Total ..	581·00

296. *Selection of area.*—In Ambasamudram felling series after planting up the area of about 20 acres available in Kariar valley planting will be taken up in Kalar valley (Sivasailam). In Kuttalam felling series the area near the Five Falls road will be taken up first and after exhausting the block the area marked in Melpidagai will be taken up. During the first two years of the period of this plan areas will be selected in Kariar valley and then in Kalar valley for the rest of the period. The question of clear felling the existing plantations will not arise during the period of the plan.

The District Forest Officer will select the area to be planted annually from within the area marked in the working plan map. The felling direction will be from east to west in order to mitigate damage from west winds. (This need not be insisted in the area near Five Falls road in Kuttalam range where the planting has been in the past proceeding from west to east.) The area selected will be surveyed by the Range Officer and demarcated by cleared lines 6 feet wide on the ground. This work will be completed by the end of October preceding the year of planting. There will be limited areas of very shallow soil and outcrops of rocks which the management will exclude for regeneration though they need not be excluded from exploitation.

297. *System of exploitation.*—Standing growth in the annual area to be planted will be put up for sale by public auction early in November, and the coupe conveyed to the successful bidder by the 15th of Decebmer for felling. The contractor will be required —

(*a*) to fell and remove all saleable produce from the area by the 31st of the succeeding March ;

(*b*) to reserve sufficient material on the ground to ensure a good burn. For this purpose removals on headloads permits and charcoal burning will be prohibited ;

(*c*) to spread the reserved material evenly over the area and burn it completely ; and

(*d*) to hand over the areas in state fit for planting by the 15th of the succeeding April at the latest.

If there is a likelihood of the contractor being unable to finish the work of felling, removal and burning within the allotted period, any or all these operations will be done departmentally and the cost thereof recovered from the contractor's security deposit, and a suitable clause to that effect shall be inserted in the agreement. No extension of the voidah beyond the 15th April will be granted on any account.

298. *Coppicing.*—All trees and undergrowths will be felled as close to the ground as possible.

SECTION 5.—TABULAR STATEMENT OF PLANTING.

299. (*a*) *Ambasamudram felling series.*—The District Forest Officer will first exhaust the area available in the Kariar valley and then proceed to the Kalar valley. It is anticipated that for the first two years of the working plan period plantations will be restricted

to Kariar valley and the area in the Kalar valley will be taken up in the third year only. (Annual area of 10 acres only will be selected for future plantations.) In view of the observations made by Sri N. D. Sahni, Conservator of Forests, in paragraphs 41 and 42 of his inspection notes, dated 28th October 1950, no teak regeneration need be taken up in Kalar valley of Ambasamudram range.

(*b*) *Kuttalam felling series.*—The area marked on the working plan map near the Five Falls road will be taken up first and only after completing this will plantation be formed in the Melpidagai reserve. It is anticipated that for the first six years of the period of this plan, plantations will be formed in the area near the Five Falls road and from seventh year onwards in the Melpidagai reserve (the annual area being 15 acres).

SECTION 6.—REGENERATION.

300. *Burning.*—Burning should start about the middle of March and be completed by the middle of April at the latest. This work done by the contractor should be effectively supervised by the Range Officer to get an even good burn over the whole area to be regenerated. Piling and re-burning should also be carried out, in case the first burn is ineffective.

301. *Inspection paths.*—After the burning is completed two inspection paths intersecting at right angles near the centre of the area to be planted will be laid out with the help of the compass. The paths will be absolutely straight, ungraded and 4 feet wide. No formation is needed beyond the lock splitting of the boundaries of the path on each side. These paths will be kept open and cleared of growth for a period of two years by the local subordinates.

302. *Aligning and staking.*—The espacement will be 6 feet by 6 feet. The aligning and staking of the area taken up for regeneration will be completed by the end of April.

303. *Planting teak.*—Stumps from the nursery will be planted in crow bar holes.

304. *Time of planting.*—Early completion of planting is most desirable. As soon as the first showers in April or May have fallen and the ground is soft enough to enable the making of crowbar holes, 9 inches deep, planting operations should be started. Once started, should be completed without delay. All planting operations should be completed by the 15th June.

305. *Casualties.*—It is essential to obtain as full a stocking as possible in the first year. Casualties must be replaced as they are noticed, but not after November. Experience has shown that, given good stumps, properly planted at the correct time and normal weather conditions, 95 per cent stocking can be obtained by the end of the first season.

306. *Agency of planting—Ambasamudram series.*—The Kanis who have more or less settled in Ambsamudram range were raising the teak plantations in Serviar and Kariar valleys by "ponam" method. They are now more or less the permanent ponamdars. They cultivate field crop, mainly tapioca, for two years and do the necessary weeding replacement of casualties and protect young plantations from sambhu attack. Thus the cost of raising the plantations has been considerably reduced and we get good teak plantations established at a very low cost. These Kanis should be encouraged and made to settle in Kalar valley when the plantations are taken up there. As this locality is far from the villages there will be only remote chance of getting local ponamdars.

307. *Kuttalam series.*—The plantations raised in this series have been done by ponam method by the local villagers. They were also of immense help in raising very cheap teak plantations. As the areas to be planted in future years are also close to the villages there will not be any difficulty in getting ponamdars as the local people know the method very well and they have been amply profited in the past by raising ragi.

The following rules will be observed in forming the plantations with the help of the ponamdars :—

(1) The aligning, staking and planting will be done by the ponamdars under departmental supervision ;

(2) The ponamdar will be permitted to cultivate tapioca, chillies and ragi. No vegetable creeper crop will be permitted.

(3) The ponamdar will replace casualties as they occur and do weedings as prescribed below ; teak stumps will be supplied to them by the department.

SECTION 7.—NURSERY.

308. *The site.*—All nursery sites will be selected by the District Forest Officer. The essentials of a good site are detailed in the Madras Forest Pocket Book, page 28.

309. *Preparation of site.*—During the normal showers in early April the site will be dug up to a depth of one foot and all stones, and small tree or shrub roots encountered will be removed.

310. *Nursery beds.*—The size of the beds will be 40 feet by 4 feet. A pathway one foot wide will surround each bed. The beds will be formed from the excavated earth, more soil being obtained from elsewhere if necessary ; such beds will be from 6 inches to 9 inches above the ground level and will be supported on all sides with split bamboo slat held in place by stout wooden pickets firmly sunk into the ground. The surface of the beds will be given slight camber to prevent stagnation of water.

311. *Fencing.*—The size shall be fenced by bamboo thorns and hard-wood supports leaving one or more swing gateways as convenient. An 8-feet high fence erected 3 feet away from the nearest bed is sufficient.

312. *Seed.*—Local teak seed should be used as past experience has shown that it has done well. Seeds should be collected from healthy mother trees, having well developed crowns, in January and February.

313. *Pre-treatment of seed.*—The Provincial Silviculturist may be consulted on the question of treatment of seeds.

314. *Quantity of stumps.*—Necessary provision must be made for original stocking of the clear felled areas and replacement of casualties. An acre will require 1,500 stumps, i.e., 1,200 for original stocking and 300 for replacement of casualties in the first year, say 25 per cent.

Thus for (10 plus 15) 25 acres 37,500 one year old stumps will be required each year.

Twenty-five standard beds of 40 feet by 4 feet will be able to produce the required number of stumps, but to be on the safe side, 30 beds may be raised.

315. *Sowing.*—Seed should be sown in the beds at the end of May or beginning of June. About 25 pounds of seed will be required per bed or 750 pounds for the division annually. Germination is hastened by covering the beds with straw laid on twigs of *Phyllanthus emblic* and watering through the straw. The straw should be removed as soon as germination has commenced.

The aim should be to produce stumps of more than three-eighths of an inch diameter at the thickest part (the larger the better) at a reasonable cost.

SECTION 8.—SUBSIDIARY SILVICULTURAL REGULATIONS.

316. *Weeding—(a) In the year of planting.*—As this work will be done by ponamdars, no precise manner of weeding will be prescribed, weeding will consist of uprooting all grass, creepers and herbaceous plants for a radius of one foot around each stump or seedling. Coppice regrowth of all fuel or useless species will be cut back, when it interferes with the teak. Weeding will commence immediately after the completion of planting and will continue progressively till the end of October.

It is most important that the casualties found during the course of weeding be replaced promptly. Early in January a final weeding of the whole area accompanied by a mumooty scraping of the soil to a width of 2 feet on either side of each row of teak plants, if necessary. It is also recommended that mulching be done simultaneously as the joint operations will assist in the young plant in tiding over the period of drought from February to May.

(*b*) *Second year weeding.*—This weeding will have to be done by the department, if the ponamdar vacates the area after one year. But usually the ponamdar cultivate the field crop in the area even during the second year and therefore this also will be done by him. This should be commenced by the 15th April and complete as soon as possible. Clean weeding in 18 inches diameter patches round stumps, or scraping as above shall be done. In addition, working of the soil round all backward plants and replaced casualties will be done in September.

(*c*) *Third year weeding.*—Normally no weeding need be done in the third year. If this is found necessary in the exceptional cases, the District Forest Officer may do it with the approval of the territorial Conservator.

317. *Pruning and cutting back.*—All double leaders shall be removed in the year of planting as soon as a plant is seen to have established itself. Damage stumps shall be cut back with a clean cut, at ground level during the first weeding in the second year, surplus shoots from stumps shall be reduced to the best one at the same time.

318. *Cleanings.*—In the fifth year after formation, the District Forest Officer shall inspect the plantation, order cleaning if it is required. It would probably be found

necessary to remove bamboo, lantana creepers and climbers and also softwood tree species such as *Helicteres isora Greura sp.* and *Sterculia sp.* which are found to over-top the teak. Bamboo regrowth should be cut back as often and as soon as young shoots appear during the tending operations in the first year and also in the fifth year cleaning if necessary. Lantana should be completely uprooted.

319. *Thinnings.*—The plantations that are in existence and those that may be formed during the period of the plan will be thinned as indicated in the tabular statement of operations. The thinning carried out in the past in the existing plantations in this division have been too light. Thinnings should be carried out under the direct supervision of the Range Officer, who will take instructions from the District Forest Officer, who will decide on the kind of thinnings to be done reference to the condition of the plantation.

320. *Thinning cycle.*—A five-year thinning cycle is considered satisfactory and hence this is prescribed. No thinning need be done for the plantations after the thirtieth year of formation.

The following statement gives the programme for thinnings :—

Year of operation.	*Range.*	*Locality.*	*Year of plantation to be thinned.*	*Area.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)
				ACS.	
1949–50	Ambasamudram	Serviar	1922–23	32·00	
	Do.	Do.	1932–33	9·60	
	Do.	Kariar	1944	20·30	
	Kuttalam	....	1933	11.90	
	Do.	....	1934	12·50	
	Do.	....	1939	22·00	
		....	1944	4·00	
1950–51	Ambasamudram	Serviar	1923–24	29·00	
	Do.	Do.	1937	17·50	
	Do.	Do.	1938	20·00	
	Do.	Kariar	1945	22·00	
	Kuttalam	....	1935	10·00	
	Do.	....	1940	22·00	
	Do.	....	1945	5·00	
1951–52	Ambasamudram	Serviar	1924–25	25·00	
	Do.	Do.	1939	20·00	
	Do.	Do.	1940	20·00	
	Do.	Kariar	1946	17·00	
	Do.	Kariar valley.	1946	44·00	
	Kuttalam	....	1936	10·00	
	Do.	....	1941	22·00	
	Do.	....	1946	5·00	
1952–53	Ambasamudram	Serviar	1941	21·30	
	Do.	Kariar	1947	20·00	
	Kuttalam	....	1932	12·50	
	Do.	....	1937	22·00	
	Do.	....	1942	22·00	
	Do.	....	1947	5·00	
1953–54	Ambasamudram	Serviar	1933–34	8·15	
	Do.	Do.	1942	22·50	
	Do.	Kariar	1948	20·00	Approximate as the exact plantation area is not known.
	Kuttalam	....	1938	22·00	
	Do.	....	1943	22·00	
	Do.	....	1948	5·00	
1954–55	Ambasamudram	Serviar	1932–33	9·60	
	Do.	Kariar	1944	20·30	
	Kuttalam	....	1933	11·90	
	Do.	....	1934	12·50	
	Do.	....	1939	22·00	
	Do.	....	1944	4·00	
1955–56	Ambasamudram	Serviar	1937	17·50	
	Do.	Do.	1938	20·00	
	Do.	Kariar	1945	22·00	
	Kuttalam	....	1935	10·00	
	Do.	....	1940	22·00	
	Do.	....	1945	5·00	
1956–57	Anbasamudram	Serviar	1939	20·00	
	Do.	Do.	1940	20·00	
	Do.	Kariar	1946	17·00	
	Do.	Kariar valley	1946	44·00	
	Kuttalam	....	1936	10·00	
	Do.	....	1941	22·00	
	Do.	....	1946	5·00	
1957–58	Ambasamudram	Serviar	1941	21·30	
	Do.	Kariar	1947	20·00	
	Kuttalam	....	1932	12·50	
	Do.	....	1937	22·00	
	Do.	....	1942	22·00	
	Do.	....	1947	5·00	

Year of operation. (1)	Range. (2)	Locality. (3)	Year of plantation to be thinned. (4)	Area. (5)	Remarks. (6)
				ACS.	
1958–59	Ambasamudram	Serviar	1933–34	8·15	
	Do.	Do.	1942	22·50	
	Do.	Kariar	1948	20·00	
	Kuttalam	....	1938	22·00	
	Do.	....	1943	22·00	
	Do.	....	1948	5·00	
1959–60	Ambasamudram	Serviar	1932–33	9·60	
	Do.	Kariar	1944	20·30	
	Kuttalam	....	1933	11·90	
	Do.	....	1934	12·50	
	Do.	....	1939	22·00	
	Do.	....	1944	4·00	
1960–61	Ambasamudram	Serviar	1937	17·50	
	Do.	Do.	1938	20·00	
	Do.	Kariar	1945	22·00	
	Do.	Kuttalam	1935	10·00	
	Do.	....	1940	22·00	
	Do.	....	1943	5·00	
1961–62	Ambasamudram	Serviar	1939	20·00	
	Do.	Do.	1940	20·00	
	Do.	Kariar	1946	17·00	
	Do.	Kariar valley	1946	44·00	
	Kuttalam	....	1936	10·00	
	Do.	....	1941	22·00	
	Do.	....	1946	5·00	
1962–63	Ambasamudram	Serviar	1941	21·20	
	Do.	Kariar	1947	20·00	
	Kuttalam	....	1937	22·00	
	Do.	....	1942	22·00	
	Do.	....	1947	5·00	
1963–64	Ambasamudram	Serviar	1942	22·50	
	Do.	Kariar	1948	20·00	
	Kuttalam	....	1938	22·00	
	Do.	....	1943	22·00	
	Do.	....	1948	5·00	

NOTE (i).—Plantations raised during the period of this plan will be thinned on a five-years cycle along with the existing plantations given above in the statement. No thinning will be done for the plantations which are over thirty years of age.

NOTE (ii).—The following six plantations raised in Ayyanarkoil series raised between 1938 and 1943 have received no or little attention. They should be tended and thinned immediately with reference to the silvicultural requirements of each plantation and the subsequent thinnings will be carried out on five-years cycle.

Plantations.

Year of planting. (1)	Location—Ayyanarkoil timber-cum-fuel series. (2)	Area planted. (3)	Effective area. (This will be filled in after survey.) (4)
		ACS.	
1938	Coupe XXVIII	30	
1939	„ XXIX	30	
1940	„ XXX	20·3	
1941	„ XXXI	25	
1942	„ I and II	30	
1943	„ XXXIII	25	

SECTION 9.—MISCELLANEOUS REGULATIONS.

321. *Fire protection.*—No special protection measures are prescribed for these existing plantations. The whole working circle will however be generally protected and any fire that may occur must be immediately extinguished by the local subordinates and fire patrols.

322. *Protection against animals.*—All plantations will be closed to grazing. As long as ponamdars are available they can be relied upon to keep away wild animals from the young plantations in the interest of their own field crops.

323. *Protection against insects.*—Defoliators and skeletonizers are not common in these localities and if they show their appearance immediately, the plantations should be treated on the advice of the Forest Entomologist.

324. *Protection from fungus.*—Fungus attack has been responsible for some damage in the existing plantations. All infected trees should be cut and removed when noticed during the periodical cleanings or thinnings.

325. *Departmental plantations.*—In the event of not getting ponamdars the work of raising the plantations will be undertaken departmentally.

326. *Control.*—The following control records will be maintained by the District Forest Officer who will be responsible for their posting :—

(*a*) The control book.

(*b*) The record of works.

(*c*) The regeneration ledger.

(*d*) The control journal.

(*e*) The control map.

(*a*) *The control book.*—In the control book will be recorded the felling prescriptions of the plan, the work carried out and the price obtained per acre.

(*b*) *The record of works.*—The record of works will be a record of all operations carried out in the working circle in connexion with regeneration and tending of the forest. It is essential that each year's plantation should be treated as a separate unit and that information against each item be accurately posted. The control form will be similar to that given in Appendix XII.

(*c*) *Regeneration ledger.*—A regeneration ledger will be maintained for each teak plantation and will contain complete details of expenditure incurred annually on its formation and tending. Items of expenditure under each head will be recorded for the first two years, and thereafter annually. The record is intended to show at a glance the total expenditure incurred on a plantation and its correct maintenance therefore is the greatest importance. A sample form is given in Appendix XII.

(*d*) *The control journal.*—A control journal will be maintained for the whole working circle and will consist of a detailed account of the management, and the extent to which the methods prescribed have been suitable, successful, economical or otherwise. As each plantation is formed, its history will be written up by the District Forest Officer personally. Brevity is to be aimed at about all information likely to be of interest to future Working Plan Officers will be recorded. A form similar to that given in the Appendix IX will be suitable.

(*e*) *The control map.*—A map of the area exploited and the area regenerated annually will be prepared on a scale of 16 inches to 1 mile, and kept on permanent record in the District Forest Office. Such maps will show the layout of the inspection paths, and the species planted or sown in each quadrant, with dates of original planting or sowing.

CHAPTER V—WORKING PLAN FOR THE AFFORESTATION WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

327. *Constitution.*—The working circle covers the whole of Kudiraimozhi Teri Reserve of 12,772 acres hereinafter referred to as the ' Teri.'

328. *Division into blocks.*—The whole reserve is at present divided into eight blocks. Each block is divided into compartments. The following table gives a list of blocks with their areas and the number of compartments into which they are divided ; the position of the block is shown on the 4 inches to 1 mile scale and management maps.

Block number. (1)	*Name of block.* (2)	*Area.* (3)	*Number of compartments.* (4)	*Remarks.* (5)
		ACS.		
I	Semmarikulam ..	2,737	4	Compartments 1, 2, 5, 8, 9 disreserved in 1925.
II	Nazareth	468	3	Compartments 1 and 4 disreserved in 1925.
III	Kachinavalae ..	1,737	6	
IV	O'Neill	1,003	10	
V	Teri	4,851	17	In 2 blocks ; only the western block is divided into compartments.
VI	O'Neill extension ..	1,260	10	
VII	Lushington	525	5	
VIII	Kanam	191	3	Experimental plots.
		12,772		

329. *Character of the vegetation.*—There has been no appreciable change in the character of the vegetation since the writing of Mr. Lasrado's plan. There is marked variation in the character of the vegetation in each block according to whether the area is unreclaimed, partially or wholly reclaimed the subject will accordingly be dealt with by blocks.

(*a*) *Semmarikulam block.*—This is practically reclaimed land and is well stocked with palmyras, *Dodonea viscosa*, *Acacia planifrons*, *Morinda tinctoria* and *Azadirachta indica*. Compartments 1, 2, 5, 8 and 9 which were disreserved in 1925, had much of the fuel growth on them cut and sold prior to disreservation, and hence it is not sufficiently well stocked.

(*b*) *Nazareth block.*—Although the whole of this was planted with palmyras in the past, a good proportion of the area has still a crust typical of windswept areas ; that it still functions as a sand supply area to the Teri block lying to the east and north-east of it is quite apparent. The growth of palmyras here is very slow, the *vadali* stage being reached only after ten years. Besides vitality of the young *vadalis* is greatly reduced by their being leased out for fibre extraction and cutting of leaves. The process of extraction of the fibre involves the exposure of the tender surface of the growing apex of the tree, thus rendering it particularly liable to attack by the palmyra beetle *Oryctes rhinoceros.* Besides palmyra the area is stocked with *Dodonea viscosa, Acacia planifrons, Azadirachta indica* and *Albizzia lebbek*, the last mentioned being the most flourishing trees.

(*c*) *Kachinavilai block.*—This has been reclaimed except for the eastern portion, compartments 5 and 6, around Kalpallam where enormous stationery sand dunes can be seen. This portion was planted with cashew from 1934 onwards. A few cashew plants are seen scattered over this area. For the most part the area contains an open stand of palmyras. The eastern portion of the block, compartments 1 and part of 2, about 200 acres contains a fairly dense crop of *Dalbergia multiflora*, and is the show place of the reserve. The northern edge again contains some scattered patches of cashew. The north-east boundary of the block abuts on the richest market garden lands of the division ; these are irrigated by channel cut into the Teri sand from very ancient times, and also by water obtained from the great Kadampa tank.

(*d*) *O'Neill block.*—This has also been completely planted up in the past with palmyras and is comparatively speaking well stocked.

(*e*) *Teri block.*—The western block has been completely planted up during the years 1929 to 1932. It includes, however, the most violently agitated portion of the whole reserve known as Naduteri. The highest point in the Teri, 190 feet above mean sea level, is in this block. The sand in the area is almost continuously on the move and dunes are being formed and as continuously being disintegrated, their crests being gradually swept off by wind action as soon as a certain height is reached. The result is that both palmyra seed and seedlings are either buried deep in the sand or exposed by the scouring action of the wind ; besides such seed as germinates is apt to be broused by the semi-wild cattle, which make this locality their home. In these circumstances any attempt at afforestation is almost certainly foredoomed to failure ; therefore until the sand supply areas to the windward side of the block, that is, in the Nazareth and Semmarikulam blocks are efficiently afforested, and until the semi-wild cattle are removed, it will not be possible to afforest this area with any hope of success. The eastern portion of this block was planted with palmyra at an espacement of 10 feet by 10 feet from 1935 onwards at 100 acres per annum. The result of palmyra sowing was satisfactory and wherever one goes, young palmyras are to be seen.

(*f*) *O'Neill extension block.*—Planting of palmyras started here in 1919 and compartments 1 to 4 were completed. Compartments 5 to 7 were planted similarly in 1932 and only compartments 8, 9 and 10 remain to be planted. The area is fair palmyra land but the shifting sands in the Teri block on its windward side may quite possibly in time overwhelm the young plantation in this block.

(*g*) *Lushington block.*—Planting of palmyras started in 1919, and compartments 1, 2, 3 and 4 have been planted. Palmyras in the hollows are doing fairly well but on the slightly higher intervening areas planting was a complete failure, owing to the nuts having been exposed by the scouring action of the wind or buried too deep by the moving sand. It is apparent that compartments 2 and 5 are sand supply areas, the former feeding the greater dunes at Kalpallam to the east, and latter threatening to overhelm the Kanam block described below.

(*h*) *Kanam block.*—This is divided into three compartments planted up with palmyras in 1892 and leased out for the first time in 1914. Compartment 3 is densely stocked, compartment 2 less so, and compartment 1 is very poorly stocked. Cashew plants are seen here and there over this area which was planted with cashew from 1941 onwards.

SECTION 2.—ANALYSIS AND VALUATION OF THE CROP.

330. *General.*—Extraction of fuel or timber is not contemplated during the period of the plan, as afforestation has not progressed sufficiently to warrant such exploitation. No analysis or valuation of the crop is called for.

At present the main item of revenue in the Teri is the lease of palmyras for the cutting of leaves and for the manufactures of fibre. Revenue is also obtained from minor forest produce (Screwpine flowers, fruits of mango, cashew, ficus species and *Calophyllum elatum*).

The following table gives the units of lease of usufruct of palmyras and minor forest produce in Teri Reserved Forest with the lease amounts from 1934–35 to 1948–49. The lease period is three years for palmyra removals.

Serial number and lease unit.	*The periods and lease amounts.* 1st January 1934 to 31st December 1937.	1st January 1938 to 31st December 1940.	1st January 1941 to 31st December 1943.	1st January 1944 to 31st December 1946.	1st January 1947 to 31st December 1949.
	RS.	RS.	RS.	RS.	RS.
1 Compartments 1 to 6 of O'Neill series.	315	301	370	52	1,005
2 Compartments 2, 3 and 5 of Nazareth series.	65	101	155	265	505
3 Compartment 4 of Nazareth series and compartments 1, 2, 5, 8 and 9 of Semmarikulam series.	120	176	195	325	583
4 Compartments 3 and 6 of Semmarikulam series.	110	101	130	265	355
5 Compartments 4 and 7 of Semmarikulam series.	210	205	250	600	605
6 Series V of Teri Reserved Forest.	25	(Included under item 2.)			
7 Plots A and B Kanam ..	25 }	136	101	435	1,400
8 Plot C Kanam	105 }				
9 Area to the north of road number 1.	101	126	175	300	670
10 Area to the south of road number 1.	50	42	55	130	275
11 Portions of compartments 2 and 3 of Kachinavilai series.	103	..	..	..	..
12 Compartments 1 to 5 of Lushington series.	..	..	..	..	..
13 Compartments 1 to 10 of O'Neill Extension series.	..	..	..	..	..

NOTE.—The amounts shown above represent the annual payments during each triennium.

The right to collect minor forest produce (Screwpine flowers, furuits of mango, cashew, etc.) is sold separately every year. The following table gives the revenue realized in the past :—

Year.		Amount.	Year.		Amount.	
		RS.			RS.	
1934–35	..	402	1941–42	..	572	Screwpine sold separately.
1935–36	..	315				
1936–37	..	475	1942–43	..	461	Do.
1937–38	..	500	1943–44	..	560	Do.
1938–39	..	464	1944–45	..	1,333	Do.
1939–40	..	405	1945–46	..	1,115	Do.
1940–41	..	370	1946–47	..	2,640	Do.

SECTION 3.—METHOD OF TREATMENT.

331. *General.*—At present the problem is not so much one of attempting to fix the shifting sand as to plant up the open areas. The map of the reserve gives one the impression that the Teri is devoid of growth but actually there are many patches of tree growth throughout the area. In addition, palmyras are to be found everywhere with seldom more than quarter of an acre left uncovered. The Conservator, after his inspection in September 1947, directed that in view of the failure of previous experiments, pot plants of *Prosopis juliflora*, *Albizzia lebbek* and cashew should be raised and planted out in November 1947. One thousand five hundred pot plants were raised and put out at an espacement of 12 feet but due to the failure of the north-east monsoon throughout South India, the experiment was not very successful, although watering was done departmentally. At the end of the hot weather in 1948 there were only 200 survivals. The experiment is to be tried again on a larger scale during the north-east monsoon of 1948. Pot plants were tried as it seemed that failure of previous experiment was largely due to the effects of the strong westerly breezes during March to July which shake up the roots and prevent establishment of the plant. For future experiment, the following instructions are given for raising the nursery and planting :—

(1) Seeds to be dibbled in pots after filling in the pots with good earth mixed with manure, hand-watering to be done for first fifteen days at the rate of a gallon for every twelve plants once a day, watering to be done in the afternoon. Thereafter for the next fifteen days watering to be done on alternate days and for the final fifteen days watering to be done once in three days.

(2) Two cart-loads of black earth or tank bed earth, one cart-load of sand and one cart-load of farmyard manure well mixed is required for every 1,000 pots. One standard bed of 40 feet by 4 feet is enough to house the 1,000 pots.

(3) When the plants are 18 inches high they should be planted out with the pot on a rainy day or on a day immediately following a day of good rain. Plants put out should be watered thrice a week to start with at the rate of one pot full equal to 2 gallons for four plants. Watering not to be done on days of rain.

(4) Planting to be done in double rows or lines which are to run at right angles to the prevailing wind direction with 12 feet between the lines. The plants in the two lines to be staggered.

(5) An intervening space of 2 chains to the leeward of the planted double rows above referred to is to be left and the next double-row is to be planted in the same manner parallel to the first two rows.

In view of the failure of the plantations raised previously, it is suggested that instead of taking up large areas for planting with *Prosopis*, the planting will be limited to an area of 25 acres annually in Semmarikulam and Nazareth blocks. Cashew will be raised over 25 acres in one block in suitable localities in Kachinavilai and Kanam beats. *Albizzia lebbeck*, Neem, *ODINA wodier* and *Dalbergia multiflora* will also be tried in the four beats in Teri Reserved Forest in an area of 10 acres annually in each beat. Two-year old nursery plants will be Nsed for neem and *Albizzia lebbeck* and cuttings for *ODINA wodier* and *Dalbergia multiflora*.

332. *Palmyra plantations.*—The south-eastern corner of Teri Block V is the only unplanted area where palmyra plantations were raised from 1934 onwards at the rate of 100 acres per annum. The result of palmyra sowing was satisfactory and it is prescribed that this should be continued. In this area, 100-acre plantations will be made annually ; the annual regeneration area has been marked on the 4 inches to 1 mile scale maps accompanying this plan. The palmyra nuts will be dibbled at an espacement of 10 feet by 10 feet in accordance with the prevailing practice, care being taken that the dibbling is completed by the 15th of October. The technique of dibbling is well understood locally and the work is done satisfactorily by contractors at a rate of about Rs. 3 an acre ; it is however described shortly below.

SECTION 4.—SUBSIDIARY SILVICULTURAL REGULATIONS.

333. *Avenues.*—With a view to establish avenues on all the main rights of way in Teri each beat guard will plant up all such paths in his beat with cuttings of *Ficus bengalensis* or *ODINA wodier*. The cutting should not be less than 6 feet in length and 2 inches in diameter. Half a mile of path will be planted up annually, the cutting being spaced about a chain apart along either side of the length of the road.

SECTION 5.—MISCELLANEOUS REGULATIONS.

334. *Patta palmyra trees.*—In the Teri reserve a curious situation has arisen with regard to some palmyra trees along the northern boundary of the Teri at the time of reservation seventy years ago patta rights were allowed for some 13,000 palmyra trees, where the pattadars were allowed to have full rights for the usufruct of the trees paying Government a nominal sum per tree. These rights were specifically reserved for the original pattadars and their legal heirs. The present position is that the right of usufruct has been sold or sub-let without proper sanction. This has led to several abuses, e.g., theft of produce from Government palmyra trees under cover patta palmyra rights. It is found impracticable to localize the identity of the original 13,000 trees, most of which have probably died but are still claimed to exist. After investigation the Chief Conservator was addressed with the concurrence of the Collector with the suggestion that the Government be addressed for the appointment of a Special Settlement Officer to settle the question of extinguishing the right of pattadars over palmyra trees in the Teri Reserved Forest.

335. *Palmyra leases.*—These form the principal item of revenue in Teri. The various lease units are detailed above.

336. *Period of lease.*—A lease period of three years adopted commencing from 1st January of the year. The current lease expires on 31st December 1949. This system works satisfactorily and hence the same lease period will be adopted.

NOTE.—A lease period of five years may be adopted from 1st January 1950 and this period will continue in future.

337. *Conditions of lease.*—(1) The lessees will leave uncut at least 12 leaves on all palmyras leased to him. A leaf is defined as one having its leafstalk quite visible outside and it will not include the two or three tender ones at the top.

(2) All dead leaves should be cut before removal of the green leaves.

(3) Cutting and removal of pathal is prohibited.

(4) All dead trees in the area leased will be reported to the Range Officer as soon as they are observed by the lessee, his agent or his coolies.

(5) The contractor shall be fully responsible for any illicit felling of trees or shrub growth or removal of produce from such fellings within the area leased out and he shall pay on demand the sum fixed by the District Forest Officer (whose decision thereon shall be final) as damages in respect thereof and the value of timber or other material removed, and such illicit fellings may render his contract liable to be cancelled in addition to the forfeiture of all moneys paid by him and all stock collected under the contract but left unremoved from the area.

(6) The lessees will supply free of charge to the Forest department such quantities of leaves as are required for regeneration operations on a proper requisition signed by the District Forest Officer or any officer authorized by him.

(7) The lessee should dig the soil round the palmyra under tapping.

338. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) Record of works.
(*b*) Plantation journal.
(*c*) Control Map,
(*d*) Control journal.

(*a*) *Record of works.*—This will be a brief record of all works with costs, carried out annually in the reserve in connexion with the improvement of the growing stock in the reserve. The various operations will be classified as follows :—

(i) Those prescribed in the Working Plan.

(ii) Those suggested in the Working Plan.

(iii) Those neither prescribed nor suggested but carried out.

(*b*) *Plantation journal.*—This will be a detailed annual record of the various operations undertaken in the raising of the plantations prescribed with costs. Expenditure will be recorded monthly for the first two years and thereafter annually. Separate records will be maintained for the fuel and cashew plantations respectively. No separate ledger need be maintained for the palmyra plantations as the work is given on contract the annual ate being recorded in the record of works.

(*c*) *Control Map.*—The area regenerated annually will be shown on the 4-inch scale maps of the Teri accompanying this plan ; the years during which regeneration operations were carried out will also be noted on the maps.

(*d*) *Control journal.*—This will be in form of a bound foolscap book and will contain a record of all noteworthy occurrences, bearing on the management and improvement of the forest. It is emphasized that only observations recorded in the field and information not obtainable from prescribed forms, should be noted in this journal. The whole of the Teri will be regarded as a unit for the purposes of this journal.

Sample forms of control records (*a*) and (*b*) and sample headings for the control journal are given in the appendices.

CHAPTER VI—WORKING PLAN FOR THE SANDALWOOD WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF THE VEGETATION.

339. *Constitution.*—The working circle includes—

(*a*) the whole of the Alagarkoil valley in Srivilliputhur range—3,930 acres ;

(*b*) the sandal area in Kuttalam reserves—812 acres ;

(*c*) the small patches of sandal which occur in the Padarmalai Timber-*cum*-Fuel Felling Series (around Mundanthurai) in Ambasamudram range, and the Valliyur reserve of Nanguneri range (area not assessed).

340. *Division into felling series.*—One felling series, the Alagarkoil Sandal Felling Series will be constituted as both the extent and the youth of the sandal crop present in the areas (*b*) and (*c*) above do not warrant their exploitation, as the annual yield would be a negligible quantity.

341. *Character of the vegetation.*—Sandal occurs in the reserves in the typical deciduous forest, its growth in the Alagarkoil valley being dense ; it is spreading here higher up the slopes where its stocking varies from light (i.e., 25 to 10 trees per acre) to scarce (i.e., less than ten trees per acre) as per the sandal stock map. In the Alagarkoil valley, it occurs at elevations varying from 500 feet to 3,500 feet while in the Kuttalam reserve it does not appear to have spread beyond an elevation of about 1,000 feet. Elsewhere in the division the sandal has been introduced departmentally and the growth does not appear to be more than 40 years old.

SECTION 2.—BLOCKS AND COMPARTMENTS.

342. *Blocks.*—The Alagarkoil sandal area has been divided into three blocks as shown below. Block boundaries have been as far as possible laid down to serve as fire lines. For purposes of extraction further subdivision of the blocks into compartments and sub-compartments may be found necessary. This will be left to the discretion of the management.

The sandal area in Kuttalam reserve has also been divided into three blocks. Elsewhere the sandal growth is too small in extent to make division into blocks necessary. The following table shows the distribution of the blocks :—

	Block number and name.	*Sandal bearing areas.*	*Total area.*
		ACS.	ACS.
	Srivilliputhur Range.		
1	Pudupatti	1,500	2,045
2	Alagarkoil	1,265	1,645
3	Athithundu	1,165	1,375
	Kuttalam Range.		
1	Kuttalam	272	272
2	Do.	256	256
3	Do.	284	284

SECTION 3.—ANALYSIS AND VALUATION OF THE CROP.

343. *Enumeration.*—As there has been no appreciable change in the distribution and condition of the sandal growth in the above blocks, no fresh detailed enumeration is considered necessary. The previous enumeration figures are given below to serve as a guide :—

Girth class.	3 *to* 6 *inches.*	6 *to* 12 *inches.*	12 *to* 18 *inches.*	18 *to* 24 *inches.*	24 *to* 30 *inches.*	30 *to* 36 *inches.*	*Above* 36 *inches.*
Alagarkoil Valley.							
Number of green trees	12,677	16,756	10,172	3,114	632	99	10
Number of dead trees	2,168	2,650	828	155	19	1	..
Total ..	14,845	19,406	11,000	3,269	651	100	10
Kuttalam Reserve.							
Number of green trees	4,737	2,992	902	263	63	10	2
Number of dead trees	15	32	5	4	..	..	..
Total ..	4,752	3,024	907	267	63	10	2

344. *Capital value of the forest.*—The estimated capital value of the forest arrived at during the preparation of the previous working plan for Alagarkoil and Kuttalam sandal areas will therefore be—

	RS.
Alagarkoil sandal area	1,64,016
Kuttalam sandal area	15,704

SECTION 4.—METHOD OF TREATMENT.

345. *Silvicultural system.*—Extraction will be limited to dead trees only, and will be conducted in accordance with the "Sandalwood Felling Rules."

346. *Regulations of the yield.*—Sandal forest in this division being far from normal, the forecast of the yield based on the past mortality per cent or a fixed mortality per cent in each girth class will be of no value. The estimated yield of the final cleaned sandalwood from the whole of the growing stock in the Alagarkoil valley and in Kuttalam reserve amounts to 224·65 tons. Assuming that the annual yield will be 2 per cent of the growing

stock, extraction being limited to dead trees only, the annual yield will be 4·49 or say 5 tons. The average annual yield for the period 1934–35 to 1945–46 amounts to six tons (vide table below) :—

Year.	Yield. GRS.	LB.	OZ.	Year.	Yield. GRS.	LB.	OZ.
1934–35	195	0	12	1943–44	1,724	19	8
1935–36	170	6	0	1944–45	388	18	0
1936–37	186	6	1	1945–46	340	16	12
1937–38	234	19	0				
1938–39	233	20	8	Total yield	6,409	24	½
1939–40	230	23	4				
1940–41	429	19	14	Average yield	534	4	5 or
1941–42	1,115	11	13½		6 tons and 54 qrs.		
1942–43	1,160	2	8				

The average annual yield may be expected to be about 5 tons during the period of the plan.

347. *Felling cycle.*—A felling of three years will be adopted as this will ensure that the annual coupe is of convenient size for extraction and tending purposes, and that dead trees are not left unduly long in the forest to permit of theft or destruction by fire.

348. *Calculation of the yield.*—No enumeration of the dead sandal trees was carried out during the revision of this plan. As only dead trees are extracted, they will be marked during the year of extraction and the yield will be calculated on the basis of the actual enumeration figures.

Section 5.—Method of Executing the Fellings.

349. *General.*—Exploitation will be of three kinds :—

(*a*) Regular.

(*b*) Periodical.

(*c*) Occasional.

In all three cases only dead trees and damaged stems or parts of trees containing scented heartwood will be extracted.

(*a*) *Regular extraction.*—This will be limited to the Alagarkoil sandal felling which has been divided into three blocks ; one block will be worked annually, the sequence of fellings being laid down below.

(*b*) *Periodical extraction.*—This will be undertaken in the Kuttalam sandal area, extraction being limited to the area annually tended.

(*c*) *Occasional extraction.*—All dead trees whenever and wherever noticed in the sandal areas in Valliyur reserve of Nanguneri Range and on the Mundanthorai plateau of Ambasamudram Range will be extracted.

350. *Regulation of working.*—Extraction will be regulated by area irrespective of outturn.

351. *Agency of fellings.*—The felling and extraction will be conducted by the Department. No change in the existing practice of cleaning sandalwood is called for.

352. *Forest depots.*—All trees uprooted in the coupes during the day will be rough cleaned and transported to the nearest forest rest-house daily where it will be stored under lock and key in one of the out-houses till a quantity sufficiently large to be sent for final cleaning is obtained.

353. *Main depot.*—All rough cleaned sandal will be final cleaned at the main depot at Srivilliputhur. The final cleaned wood will be packed securely in gunny bags and despatched in accordance with the existing practice for sale.

354. *Tabular statement of fellings.*—The following table shows the sequence of fellings in the Alagarkoil sandal felling series :—

Year.	Block number.	Extent. ACS.
1949–50	I	2,045
1950–51	II	1,645
1951–52	III	1,375
1952–53	I	2,045
1953–54	II	1,645
1954–55	III	1,375
1955–56	I	2,045
1956–57	II	1,645

Year.	Block number.	Extent.
		ACS.
1957–58	III	1,375
1958–59	I	2,045
1959–60	II	1,645
1960–61	III	1,375
1961–62	I	2,045
1962–63	II	1,645
1963–64	III	1,375

SECTION 6.—SUBSIDIARY SILVICULTURAL REGULATIONS.

355. *Tending.*—Tending of the sandal crop is a matter of the greatest importance; the more easily accessible portions of the crop, i.e., on either side of Athithondus-Puliyuthur path, have been tended in the past with great benefit to the individual trees. A regular tending plan is therefore prescribed.

356. *Tending cycle.*—It is advantageous that tending be carried out simultaneously with the enumeration, and marking of dead trees for extraction, as this would ensure economy in expenditure and also frequent tending of the young crop. The tending cycle will therefore be three years. In the Alagarkoil valley the block under extraction will be tended. In the Kuttalam reserve the sandal area has been divided into three blocks. One block will be tended annually, all dead trees found in the course of tending operations being extracted.

357. *Nature of tending.*—Three factors are of importance to the growth of young sandal—lateral shade, overhead light and the presence of suitable host trees. In the case of older trees, one foot girth and above, sandal being a strong light demander, as much light as possible should be given in order to assist crown development and consequent diameter increment. The following rules for the guidance of the tending officers are laid down :—

(*a*) No tree or plant that serves or might serve as a host to sandal should be destroyed ; when necessary such growth should be coppiced or pollarded.

(*b*) All climber growth should be cut.

(*c*) In the case of seedling and sapling growth below 9 feet in height, all lateral shade should be preserved, and only overhead light admitted in order to encourage height growth. All cut material should be placed around the sandal saplings both to provide lateral shade and keep but browsers.

(*d*) In the case of older trees overhead shade should be removed.

358. *Tabular statement of operations*—

Year.	*Locality.*	*Block number.*	*Sandal bearing areas.*
			ACS.
1949–50	Algarkoil	I	1,500
	Kuttalam	I	272
1950–51	Alagarkoil	II	1,265
	Kuttalam	II	256
1951–52	Akagarkoil	III	1,165
	Kuttalam	III	284
1952–53	Alagarkoil	I	1,500
	Kuttalam	I	272
1953–54	Alagarkoil	II	1,265
	Kuttalam	II	256
1954–55	Alagarkoil	III	1,165
	Kuttalam	III	284
1955–56	Alagarkoil	I	1,500
	Kuttalam	I	272
1956–57	Alagarkoil	II	1,265
	Kuttalam	II	256
1957–58	Alagarkoil	III	1,165
	Kuttalam	III	284
1958–59	Alagarkoil	I	1,500
	Kuttalam	I	272
1959–60	Alagarkoil	II	1,265
	Kuttalam	II	256
1960–61	Alagarkoil	III	1,165
	Kuttalam	III	284
1961–62	Alagarkoil	I	1,500
	Kuttalam	I	272
1962–63	Alagarkoil	II	1,255
	Kuttalam	II	256
1963–64	Alagarkoil	III	1,165
	Kuttalam	III	284

359. *Sandal propagation centres.*—The method of raising sandal propagation centres is fairly well known in this division as this work has been carried out for the last fourteen years. Propagation centres will be established only in forests which do not already contain

sandal and which are not included in the Timber-*cum*-Fuel Working and Fuel Working Circles. The following localities were selected as suitable for raising the propagation centres :—

Name of range.	*Name of beat.*	*Locality.*
Ambasamudram	Kadiyam	Ramanadhi valley.
	Aladiyur	Outside the limits of the Koilteri timber-*cum*-fuel felling series.
Nanguneri	Sengalteri	The Munglipattikidai valley.

Sandal propagation centres were raised in the above localities from 1934–35 to 1945–46. The results so far achieved in Kadayam and Aladiyur beats are encouraging.

Under the instructions of the Chief Conservator of Forests, sandal propagation centres were raised during 1946–47 in 34 beats of the division in Ambasamudram, Kuttalam and Srivilliputhur Ranges. Except in Srivilliputhur Range the results in the other ranges were generally satisfactory. This was continued during the year 1947–48 also. Areas adjacent to these centres will be selected for future years.

Name of range.	*Nzame of beat.*	*Locality.*
Ambasamudram	1 Kadayam	Sambanathi bank.
	2 Govindaperi	Illupiar bank
	3 Sivasailam	Kallar bank
	4 Ambur	Vaddakkukorai Ar. bank.
	5 Koriar	Tekkukorai Ar. bank.
	6 Aladiyur	Near channel.
	7 Koilteri	Kuduvarai (near northern bank of Serviar).
	8 Padarmalai	Southern bank of Serviar.
	9 Kodamady	Do.
	10 Kariar	Bank of Kariar.
	11 Kannikatty	Bank of Ullar.
Kuttalam	1 Vasudevanallur	Near Rasingaperi Ar.
	2 Karuppaswami koil	Jungle stream bank.
	3 Pulliangudi	Kottamalai river bank.
	4 Naranapuram	Kottamalai bank.
	5 Chintamani	Virasadaikidai Ar. bank.
	6 Krishnapuram	Banks of Kuluratti
	7 Kadayanallur	Do.
	8 Chinnakadu	Banks of Modayar.
	9 Pumbli	River bank.
	10 Kuttalam	Chittar bank.
	11 Aiyiraperi	River bank.
	12 Vallam	Do.
	13 Mathalamparai	Stream banks.

In those beats each beat guard will be entrusted with the work of establishing four propagation centres annually. The selection of the sites for the propagation centres will be done by the Range Officer concerned. The essentials are :—

(*a*) the presence of vigorous and healthy trees to act as hosts,

(*b*) sufficient moisture in the soil and

(*c*) sufficient lateral shade.

Stream banks are therefore particularly recommended. A clearing of 10 feet by 10 feet should be made in the middle of a clump of trees and bushes ; the cut materials should be piled up evenly over the clearing and burnt in April. The resulting ash should be mixed up with the soil and the little plot fenced adequately against game and cattle. Early in May, shallow saucer like depressions 5 inches in diameter and at an espacement of about 3 feet by 3 feet will be made in the plot, and layer of good seeds 10 to 15 in number dumped in them. This layer will be covered with damp straw or moist humus *Cajanus indica* (dhall) seed may with advantage be broadcast sown in the area simultaneously in order to provide hosts for the young sandal seedlings. The dumps should be watered profusely in case there is no rainfall and, after germination has occurred, occasional watering will be necessary until either of the monsoons sets in. Rodents are particularly fond of sandal seeds and it is possible that all the seeds in the dumps may be eaten by them. To obviate this danger, seedlings may be raised in bamboo baskets by beat guards near their head-quarters and used to replace casualties. Sandal seeds, once they germinate, are not attacked by rodents.

Periodical aeration of the soil by forking is advisable but care should be taken that this is done under proper supervision so that the delicate haustorical root attachments of the sandal on its host are not disturbed. Full stocking in the first year will be secured by replacement of casualties, where necessary. Survivals will be enumerated in May for two years following the year of formation and the results recorded in the control journal. A 4-inch scale map showing the position of all propagation centres will also be pasted at the proper place in the journal.

360. *Seed collection.*—All seeds required for regeneration operations will be collected from local healthy seed bearers. Seeds from other divisions should on no account be imported

owing to the possibility of introducing spike disease with it. This is a matter of great importance and the prescriptions must be carefully observed.

Fresh ripe fruit should be collected from vigorous well grown trees with thick dark green leaves ; the outer skin and the pulp from the seed should be removed as soon as possible after collection, by macerating the fruit in water. The seed should be carefully dried in the sun and sown with the minimum of delay. If storage is found necessary, the seed should be stored in air-tight tins.

SECTION 7.—MISCELLANEOUS REGULATIONS.

361. *Patta sandal.*—There is some sandal in the patta lands adjoining the Algarkoil valley in Srivilliputtur Range ; the majority of it is to be found on the lands of about 300 acres in extent, called "Sembagatope" belonging to the Srivilliputtur temple. The patta lands adjoining the sandal area in Kuttalam reserve also contain sandal to a very limited extent.

In this division Government has no right whatsoever to any of the sandal growing in patta lands. With the exception of Srivilliputtur temple trustees who occasionally extract sandal for the requirements of the temple only and not for commercial purposes, the other pattadars do not appear to realize the value of the sandal on their patta lands much of the regeneration being burnt annually during cultivation operations. Buying and extracting the green sandal is out of the questions as many of the pattadars are not in the habit of selling the sandal on their patta lands.

As the quantity available is small and not likely to increase largely in the future owing to the increasing pressure of cultivation, patta sandal working is not recommended. Adequate control over patta sandal can be secured by a rigorous application of the Sandal Wood Transit Rules. Attempts will however be made by the District Forest Officer to induce pattadars to sell the dead sandal trees to us for extraction, the rate of payment therefor being decided by the territorial Conservator. The working circle with the exception of sandal and fuel regeneration areas will be open to grazing.

362. *Fire protection.*—The protection of the working circle from fire is of the first importance. In rugged country, such as is present in the working circle, fires are difficult to control except by an elaborate system of internal and external fire lines which are far too expensive to maintain. However, all the roads and paths in frequent use will be fire traced annually. Prescriptions to this effect are detailed under fire protection.

363. *Control.*—The following control records are prescribed and the District Forest Officer will be personally responsible for their accurate maintenance :—

(*a*) The control book.
(*b*) The record of works.
(*c*) Control journal,
(*d*) Propagation centre journal.
(*e*) Control map.

(*a*) *Control book.*—This will be a record of all exploitation carried out annually in the working circle with yields obtained. Any deviation from the working plan prescription with the authority for such deviations will be noted in the appropriate column of the control book.

(*b*) *The record of works.*—This will be a record of measures prescribed and undertaken for the regeneration and improvement of the forest. In addition, measures suggested in the Working Plan, together with measures neither prescribed nor suggested but carried out will find a place in the record.

(*c*) *Control journal.*—This will be in the form of a bound note-book and will contain the personal observation of the District Forest Officer on the growing stock, and its exploitation and regeneration, as laid down in section 50 of the Madras Forest Code. It should also detail the quantity of sandal disposed of in retail sale annually and the agency employed.

(*d*) *Control map.*—A control map of each block on a scale of 4 inches to 1 mile will be prepared annually and will show—

(i) the area actually exploited,
(ii) the approximate position of dead trees or groups of trees extracted.
(iii) the area containing the spiked sandal, if any,
(iv) the area tended and,
(v) the area regenerated annually.

These maps will be recorded annually in the control journal.

CHAPTER VII—WORKING PLAN FOR THE GRAZING WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION OF THE WORKING CIRCLE AND CHARACTER OF VEGETATION.

364. *General constitution.*—The working circle will include all the reserved forests of the division with the exception of specified areas which are or may be closed to grazing for silvicultural or other reasons.

365. *Permanent closure.*—The following areas will be permanently closed to grazing :—

	Range.	*Locality.*	*Area in acres.*
(1)	(2)	(3)	(4)
1 Regeneration Working Circle ..	1 Kuttalam felling series.	....	581
	2 Ambasamudram ..	Ambasamudram felling series.	633
2 Bison santuaries	1 Nanguneri	Mahandragiri	1,500
		Pechimadankadu	2,500
		Area near Venganikan anicut.	2,500
3 Important Catchment areas situated above the Grazing Working Circle boundary.	1 Srivilliputtur	Srivilliputtur reserved forest.	18,639
	2 Kuttalam	Kuttalam reserved forest.	4,354
		Krishnapuram reserved forest.	2,783
		Kadayanallur reserved forest.	3,916
		Vasudevanallur reserved forest.	6,989
	3 Ambasamudram	Papanasam reserved forest.	57,022
	4 Nanguneri	Kalakad reserved forest.	23,268
4 The Afforestation Working Circle.	1 Nanguneri	Kudiraimozhi Teri reserved forest.	*12,772·20

* The mistake in keeping open 1,472 acres to grazing from 1937–38 to 1949–50 is ratified in Chief Conservator's reference Mis. No. 157/52, dated 8th May 1952 (101/52–T).

NOTE.—The areas specified in items (1) and (2) are included in item (3) a description of the boundaries of the grazing working circle is given in the appendix.

366. *Temporary closure.*—All coupes of the timber-*cum*-fuel and fuel working circle will be closed for five years including the year of felling. All sandal regeneration areas will be closed to grazing for a period of ten years after formation ; the area thus closed will be comparatively speaking negligible.

In addition, areas subject to incendiarism may also be closed to grazing subject to the condition that the aggregate of the area so closed at a time does not exceed 1,000 acres and provided that the District Forest Officer submits a report to that effect to the Collector and to the Chief Conservator through the Conservator. This course will be adopted only when the District Forest Officer considers that burnt area is so expensive and damage to tree growth so severe as to warrant closure to grazing. for silvicultural reasons.

367. *Character of the vegetation.*—The greater portion of the working circle consists of deciduous forest for varying density of stocking. In the poorest areas such as the Kunnur Beat of Srivilliputtur Range and the Vallanad reserve of Nanguneri Range, grass is normally available for only two to three months of the year during the north-east monsoon. The trees that yield leaf fodder are much lopped in these areas specially by sheep graziers ; cattle also browse on young growth of fuel species. In areas which get the benefit of both the north-east and south-west monsoons, fairly good fodder is normally available from July to the end of February.

The fuel felling series on the outer slopes on account of their proximity to the villages and the character of the vegetation, provide the greater portion of the requirements of the population. Above these working circles and below the zone of Shola forests are stretches of steep grass land sparsely stocked with deciduous tree growth. The principal grass here is *Andropogon bladii*, a course tall grass of poor nutritive value ; if burnt tender shoots produced are palatable to cattle ; this fact is known to the graziers and is one of the chief causes of incendiarism. Burning on the steep slopes naturally results in further deterioration of the growth and subsequent soil erosion. Freedom from fire on the other hand would eventually induce the natural regeneration of tree species, and thus incidentally produce in time those grasses of a much higher nutritive value which are usually found in open woodland forest.

SECTION 2.—BLOCKS AND COMPARTMENTS.

368. *Grazing units.*—The whole division forms one grazing unit ; accordingly a grazing permit is valid over the whole division. In actual practice however, cattle from the village in one range are seldom taken to another range for grazing, and it will be convenient therefore for control purposes to make the range the unit of grazing especially as the revenue is collected separately for each range.

The following statement shows details of areas open and closed to grazing in each reserve by range :—

Name of reserved forest. (1)	*Area open to grazing.* (2)	*Areas closed to grazing.* (3)	*Total area of the reserved forests.* (4)
	ACS.	ACS.	ACS.
Srivilliputtur Range.			
Srivilliputtur	25,595	18,639	44,234
Valikulam and Sappanipurambu	1,569	..	1,569
Total	27,164	18,639	45,803
Kuttalam Range.			
Kuttalam	5,450	4,354	9,804
Vadagarai Melpidagai	506	..	506
Kadayanallur	4,469	3,916	8,376
Krishnapuram	2,830	2,783	5,613
Vasudevanallur	20,300	6,980	27,289
Total	33,546	18,033	51,588
Ambasamudram Range.			
Papanasam	26,190	57,022	83,212
Nanguneri Range.			
Kalakad	31,983	23,268	55,251
Valliyur	717*	..	717
Kolundamamalai	1,539	..	1,539
Terkkuviravanallur	3,187	..	3,187
Manpothai	1,242	..	1,242
Vallanad	5,087	..	5,087
Kudiraimozhi Teri	..	12,772	12,772
Total	43,755	36,040	79,795
Grand total	130,655	129,743	260,398

* The whole reserve to be open to grazing or four months for every year from 15th October to 15th February when grazing is in demand (vide G.O. No. 1549, dated 12th July 1937, C.C.P. Mis. No. 383, dated 16th July 1937.

SECTION 3.—METHOD OF TREATMENT.

369. *Object of management.*—The object of management will be—

(*a*) to provide adequate pasture for cattle in villages adjoining reserves, consistent with the conservation of the forest and with the object of management of other working Circles.

(*b*) to limit the grazing incidence and to produce revenue by imposing a fee for licensing cattle to graze in the forest :

(*c*) to attempt the improvement of grass and grazing facilities.

SECTION 4.—MISCELLANEOUS REGULATIONS.

370. *Regulation of grazing fees.*—Grazing will be regulated by the issue of permits subject to the usual conditions which are printed on the back of them. The following domestic animals may be licensed to graze, the existing rates being levied :—

Description of animals.	Rate per head. RS.	A.	P.
Sheep	0	2	0
Cows and bulls and asses	0	4	0
Buffaloes	0	8	0
Elephants	5	0	0

Goats will on no account be licensed to graze or admitted into any of the reserves.

The grazing revenue will be collected departmentally. As this system works satisfactorily no change in the agency of collection is advocated.

371. *Grazing year.*—The grazing year will be the fasli year—starting from 1st July and extending to the following 30th June.

372. *Penning.*—The grazing incidence varies from 3 to 5 acres per cow unit. The fuel series situated mostly on the outer slopes of the ghats are overgrazed. The incidence of grazing should be made more even by encouraging graziers to visit the remoter parts of the forest. Penning tends to get this object achieved. Therefore penning is desirable and should be encouraged, provided graziers can be prevented from burning the forest.

373. *Regulation of penning.*—The following regulations will be observed :—

(i) No penning will be allowed within half a mile of the bison grazing grounds, namely, Pechimadankadu around Netterikal and Nadugani in Nanguneri Range.

(ii) Penning will be restricted to the limits of the Grazing Working Circle as laid down in the Working Plan maps.

(iii) Penning within the timber-*cum*-fuel, fuel and sandal working circles will be prohibited.

(iv) No fee for penning will be collected.

(v) Permits for penning will be issued by the Range Offficers with the previous approval of the District Forest Officer who will satisfy themselves by inspection if necessary, that the locality of the pen does not violate any of the above regulations.

For this purpose a list of approved pens in the division will be maintained in the District Forest Office and Range Offices.

374. *Fodder Grass.*—This item will continue to be leased out for commercial purposes along with other minor forest produce with the proviso that cutting and removal free by head-loads by the public for bona fide domestic purposes and free removal by the ryots and co-operative milk supply unions and societies, for the manufacture of silage will be permitted, except from areas which are closed to grass cutting for silvicultural or other reasons. The lease should be subject to any concession the Government may order from time to time regarding the free removal of grass by the public, co-operative and private bodies or individuals.

375. *The annual grazing demand.*—The following statement gives an idea of the annual grazing demand in each range as seen from the villagewar statement for 1946–47 :—

Year.	*Cows and bulls.*	*Sheep.*	*Buffaloes.*	*Asses.*
	Srivilliputtur Range.			
1946–47	6,114	4,076	..	15
	Kuttalam Range.			
	7,999	2,641	172	27
....	*Ambasamudram Range.*			
....	4,372	1,050	850	..
....	*Nanguneri Range.*			
	6,140	10,054	283	..

The number of cattle visiting the reserves in each range has increased.

376. *The annual supply.*—The timber-*cum*-fuel working circles have a total area of 66,950 acres. As the five youngest coupes are proposed to be closed to grazing one-eighth of the former and one sixth of the latter will not be available. The average areas thus closed in both these working circles will amount to about 10,260 acres.

377. The total area available for grazing below 1,500 feet contour in the division amounts to 82,300 acres ; deducting from this 10,260 acres referred to above 72,040 acres will remain permanently open to grazing unless any portion of it has to be closed on account of fires as provided for. On the basis of 4 acres per cow unit this will suffice for 18,010 cow unit.

378. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) Control book. .. ..

(*b*) Control journal. .. ..

(*c*) Control map. .. ..

(*a*) *Control book.*—This will be a record showing the actual area in each range open to grazing together with the number and description of cattle licensed to graze annually.

(*b*) *Control journal.*—This will be a record of personal observations made by the District Forest Officer on the effects of grazing the adequacy of provisions made for grazing, and the suitability or otherwise of the various prescriptions of the working plan in relation to grazing and penning.

(*c*) *Control map.*—A control map on a scale of one inch to one mile shall be prepared in the District Forest Office for each range annually showing areas—

(*a*) permanently closed ;

(*b*) temporarily closed ; and

(*c*) penning sites commonly used.

CHAPTER VIII—WORKING PLAN FOR THE MINOR FOREST PRODUCE WORKING CIRCLE.

SECTION 1.—GENERAL CONSTITUTION AND CHARACTER OF THE VEGETATION.

379. The Working Circle covers all the reserves of the division. The main items of the minor forest produce collected are, avaram bark, bees wax and honey, cashewnuts, thatch and fodder grass, gallnuts, Indukodi (*Acacia intisia*) Itakalli (*Ochalandra Sp.*) Kelakai (*Carissa Carandas*) rattan tamarind and the usufruct of palmyras, stone and gravel.

380. *Farms.*—In order to stimulate competition, each range is divided into farms. Wherever a particular produce exists in sufficient quantities in a particular farm, this produce is to be put up for sale separately, e.g., tamarind. The farms and units of sale are noted in the statement below.

Units of sale. (1)	*Nature of produce.* (2)	*Farms number.* (3)	*Locality.* (4)	*Remarks.* (5)
			Srivilliputtur Range.	
1	All minor forest produce except tamarind and usufruct of palmyras.	I	Mudangiar	Including Mudangiar Rest-house compound.
2	All minor forest produce including usufruct palmyra trees in Rangar koil beat and in Valarkulam Reserved Forest but excluding tamarind.	II	Athithondu	
3	All minor forest produce except tamarind and usufruct of palmyras.	III	Pudupatti	Including Pudupatti Rest-house compound.
4	Tamarind	I	Mudangiar	....
5	Do.	II	Athithondu	....
6	Do.	III	Pudupatti	....
7	Stone and gravel	III	Do.	Outside the limits of the fuel working circle.
			Kuttalam Range.	
8	All minor forest produce except tamarind, itakalli and rattan.	I	Vasudevanallur reserve	....
9	All minor forest produce except itakalli and rattan.	II	Krishnapuram reserve	....
10	Do.	III	Kadayanallur, Chinnakadu, Vadagarai Kilpidagai and Vadagarai Melpidagai reserve.	....
11	Do.	IV	Kuttalam reserve	Including Kuttalam Rest-house compound.
12	Itakalli and rattan	I	Vasudevanallur reserve	....
13	Do.	II and III	Krishnapuram, Kadayanallur, and Chinnakadu.	....
14	Do.	IV	Vadagarai Kulpidagai reserve.	....
15	Do.	VI	Kuttalam reserve	....
16	Tamarind	I	Vasudevanallur reserve	....
17	Avaram bark		Unreserves of Sankarankoil taluk. This unit will be sold by the Revenue Department and the lease amount credited to VII. Land Revenue—G.O. Ms. No. 1915, Development, dated 16th August 1940.	....
18	Do.		The whole range	....
			Ambasamudram Range.	
19	All minor forest produce except rattan usufruct of palmyra and coconut and cardamum.	I	Papanasam section. Including Sivasalan Rest house compound.	....
20	Do.	II	Kariar section	....
21	Rattan and Itakalli	I	Papanasam section	....
22	Do.	II	Kariar section	....
23	Usufructs of palmyras and coconuts.	I	Papanasam section	....
24	Wild cardamum. The whole range excluding areas leased out for cardamum cultivation.		....	....
			Nanguneri Range.	
25	All minor forest produce excluding itakalli and rattan.	I	Reserves in Ambasamudram taluk.	....
26	Do.	II	Vadagarai	....
27	Do.	III	Kalakad—including Sivanaperi Rest house compound.	....
28	Do.	IV	Nambikoil	....
29	Do.	V	Parivarisurian	....
30	Rattan		The whole range	....
31	Itakalli		Do.	....

Nanguneri Range—cont.

Units of sale.	Nature of produce.	Farms number.	Locality.	Remarks.
(1)	(2)	(3)	(4)	(5)
32	Stone and gravel	..	Kolundumamalai east slopes quarry.	....
33	Do.	..	Kolundumamalai north slope quarry.	....
34	Honey and wax	..	Vallanad reserve	Any other minor forest produce for which there is a demand may be included.
35	Screwpine flowers, fruits of mangoe cashew, ficus sp. and punnai (*Calphyllum inophyllum*).	..	Kudiraimozhi Teri reserve ..	....

Lavangam bark.—In view of the good revenue realized for Lavangam bark in the previous years this item may be sold as a separate item on a five-year rotation taking one unit each year as follows :—

Name of range.	Locality.	Period of lease.
Singampatty	Whole range excluding areas leased out to B.B.T.C.	One year.
Ambasamudram	North of Serviar	Do.
Do. ..	South of Serviar	Do.
Nanguneri	Whole Range	Do.
Kuttalam	Do.	Do.

Each year's lease unit will be divided into two blocks at the discretion of the District Forest Officer and the contractor will be permitted to work only in one block at a time. Only after completing work in the first block, he will be allowed to get into the other and once he vacates a block, he will not be allowed to re-enter the same again.

To avoid the damage caused to the trees by complete debarking, the following two special conditions may be enforced :—

1. Trees below five feet in girth should not be debarked.

2. One strip of bark of not less than 18 inches in width should be left in tact continuously on anyone side of the trunk from the bottom straight upwards. On the branches, the strip will not be less than one third of the girth of the branches concerned.

SECTION 2.—METHOD OF TREATMENT.

381. *Agency of exploitation.*—The right to collect minor forest produce will be leased annually, to contractors each of the above mentioned items being sold in public auction. Deer horns will be collected departmentally.

In case, the prices obtained at the sales are unsatisfactory it is suggested that tenders may be called for by the District Forest Officer.

Auction sales will be held between the 15th of May and the 15th of June.

382. *Period of lease.*—All sale units will be leased out for the fasli year from 1st July to the 30th of the succeeding June.

383. *Supply and demand.*—Practically all the minor forest produce collected is absorbed locally. Tamarind from Srivilliputtur range is exported to Madurai. The average annual revenue for the 10-year period from 1936–37 to 1945–46 is Rs. 20,520. The abnormal increase in the revenue is due to a steady increase of demand during the war period.

SECTION 3.—SUBSIDIARY SILVICULTURAL REGULATIONS.

384. *Tamarind.*—With a view to increasing the stock of tamarind trees in the reserves and also to provide shade, it was prescribed that the beat subordinates should annually plant at least 100 tamarind plants on either side of main roads, cart-tracks and bridle-paths passing through the deciduous forests occurring in their beats.

The results obtained in the past are not satisfactory and therefore it is suggested that this prescription should receive the personal attention of the District Forest Officer.

It is recommended that stump plants about a year old be used for the purpose and each plant be protected from browsing by a thorn fence. The planting should be done about 40 feet apart along the length of the road or path and ample room should be left for the future widening of the road or path where necessary, localities obviously unsuitable for tamarind such as rocky ground will not be planted.

385. *Dammar.*—The prescription of Mr. Lasrado's plan for the collection of dammar by the contractor's coolies by the ignition method proved a failure. The usual method of collection of gums will be adopted.

386. *Control.*—The District Forest Officer will be responsible for the accurate maintenance of the following control records :—

(*a*) Control book,

(*b*) Record of works, and

(*c*) Control journal.

(*a*) *Control book.*—This will be a record of the various items leased out annually with prices obtained ; full details of the kinds and quantities of minor forest produce collected according to contractor's accounts will also be recorded.

(*b*) *Record of works.*—This will be a record of all operations carried out annually in the working circle.

Forms with sample entries of control records (*a*) and (*b*) are given in Appendices XXIV and XXV.

(*c*) *Control journal.*—This record will contain the personal observations of the District Forest Officer should include remarks on the following points :—

(i) The advisability of extending or reducing the size of the various sale units.

(ii) The period of the year during which various items of minor forest produce are available for collection in various localities.

(iii) The cost of collection of the more important items of minor forest produce.

(iv) The prevailing market rate for such items annually.

(v) Notes on the identification of various kinds of minor forest produce in demand.

(vi) Suggestions for increasing the yield from any particular produce with results of experiments carried out in this direction.

CHAPTER IX—MISCELLANEOUS REGULATIONS.

SECTION 1.—BAMBOO.

387. *Bamboo.*—The bamboo (*Bambusa arundinacea*) is found in scattered patches, each varying from 1 to 25 acres in extent in the following localities in this division :—

Name of range.	*Locality.*	*Quantity.*
Srivilliputtur	1 Valaikulam reserve	A few clumps.
	2 Mouth of Alagarkoil valley	Do.
	3 The Gandamanikkanur path above the cairns line.	A few clumps. Extracted in 1936–37 and 1939–40.
	4 The left bank of Ammankoil Ar.	
	5 The right bank of Rajamparai Ar.	
Kuttalam	6 Vasudevanallur reserve	Exploitable.
	7 Vadagarai Melpidagai and Kilpidagai reserves.	A few clumps.
	8 Kuttalam reserve. Vallam beat.	Exploitable.
Ambasamudram ..	9 Kadayam	Do.
	10 Sivasailam	Do.
	11 Idaimuttikidai. Koilteri beat.	Do.
	12 Aladiyur	Do.
Nanguneri	13 Kalakad timber *cum* fuel felling series ..	A few clumps.
	14 Kodamadi Ar. valley	Do.
	15 Valliyur reserve	Exploitable.
	16 Mungilpattikidai valley	Do.

388. *Bamboo working.*—The following prescriptions relating to bamboo working is laid down :—

(i) The felling cycle will be three years. For the purpose of working, the exploitable bamboo areas in each range will be grouped together into one felling series each area being worked once in three years. There is no necessity for regulating the volume yield, as the supply forms a very small percentage of the annual requirements of the division which are met from the forests of the adjacent Travancore State.

The following table gives a statement of fellings :—

Name of felling series.	*Year of working.*	*Bamboo area.*	*Remarks.*
Kuttalam	1949–50	....	....
	1952–53	....	....
	1955–56	I. Kuttalam reserve Vallam beat.	....
	1958–59	....	....
	1961–62	....	....
	1950–51	....	....
	1953–54	....	....
	1956–57	II. Vasudevanallur reserve ..	....
	1959–60	....	....
	1962–63	....	....

Name of felling series.	*Year of working.*	*Bamboo area.*	*Remarks.*
Srivilliputtur	(Only when there is demand).	III. Ayyanarkoil and Mudangiar beats.	Sold only once during 1936–37.
Ambasamudram	1949–50	....	....
	1952–53	....	....
	1955–56	....	....
	1958–59	IV. Aladiyur beat	....
	1961–62	....	....
	1950–51	....	....
	953–54	....	....
	1956–57	....	....
	1959–60	V. Sivasailam beat	(Last sold in 1938–39).
	1962–63	....	....
	1951–52	....	....
	1954–55	....	....
	1957–58	VI. Koilteri beat (Idaimuttikidai).	....
	1960–61	....	....
	1963–64	....	....
Nanguneri	1950–51	Valliyur Blocks	(Sold together in 1944–45).
	1953–54	....	....
	1956–57	....	....
	1957–58	....	....
	1960–61	....	....
	1963–64	....	....
	1951–52	....	....
	1954–55	VII. Mungilpattikudi valley	....
	1954–55	....	....
	1957–60	....	....
	1960–61	....	....
	1963–64	....	....

(ii) It was prescribed in the previous working plan that the contractor will be required to reserve all first year culms and at least eight older culms in each clump in order to ensure mechanical support and also to provide sufficient nutriment for the natural extension of the clump. After working for two years it was found that the retention of eight older culms needed modification as almost all the retained culms were found to have been damaged by wind, and that one in four of the older culms only need be retained. Accordingly the deviation was sanctioned in Chief Conservator's Mis. No.88, dated 23rd February 1937. This modified prescription worked satisfactorily and hence no change is advocated.

The following felling rules will be observed :—

(*a*) All culms one year old and below will be retained.

(*b*) In addition to these 1 in 4 of the older culms will be retained.

(*c*) Culms felled must be cut not less than one foot or more than two feet from ground level.

(*d*) No damage should be done to the culms retained in the clump but side branches may be cut where necessary.

(*e*) In the selection of culms for retention preference should be given to those situated on the side of the clump where the majority of new culms are found.

(iii) Whenever gregarious flowering of *Bambusa arundinacea* is observed in any locality the whole area will be put up for auction, all restrictions regarding felling being removed. The period of contract will be the official year and if at the end of this some culms are left unworked the area will be sold once more in the succeeding year.

(iv) The District Forest Officer, will be permitted to put up for sale any of the small bamboo areas mentioned above in paragraph 387 but not included in the tabular statement of fellings, provided he is satisfied that a demand exist and the clumps are exploitable. Every such area will be exploited only once in three years working being regulated by the above prescriptions.

389. *Bamboo regeneration.*—In the past *Bambusa arundinacea* was introduced in Ambasamudram range (on the banks of Thambrabarni and Serviar) and in Nanguneri range (on the banks of Pechi Ar. Nambikoil Ar. and near Nettarikal) by planting of rhizomes. The results achieved, were satisfactory and hence it is prescribed that the artificial introduction of the above species will be done in the localities where it has already done well. The following prescriptions regarding the artificial introduction of this bamboo are laid down :—

(i) Five acres will be planted annually in Alandiyur beat at an espacement of 33 feet by 33 feet. The area will be selected by the District Forest Officer.

(ii) In each of the following localities rhizomes will be planted in 200 pits annually :—

(*a*) On the banks of Serviar.
(i) Padarmalai beat.
(ii) Koilteri beat (Ambasamudram range).

(*b*) On the banks of—
(i) Pechi Ar. (Nanguneri range).
(ii) Nambikoil Ar.

(iii) The method of propagation is by the planting of two-year old rhizomes. But the District Forest Officer with the consultation of the Provincial Silviculturist will be permitted to alter the method of propagation.

(iv) The District Forest Officer will address the Provincial Silviculturist and arrange to get the required number of rhizomes.

(v) The off-sets will be planted out in the forest as soon as the first showers in April-May have made the ground soft enough for planting. Each off-set will be surrounded by a circular thorn fence least five feet high in order to prevent damage from browsers.

(vi) Casualties will be replaced at the beginning of the second growing season.

(vii) The District Forest Officer with the previous approval of the territorial Conservator will be at liberty to introduce this bamboo in any other area which he considers suitable, provided that each area is not already included under the timber-*cum*-fuel or fuel working circles, and that it is sufficiently accessible to make bamboo planting a remunerative proposition.

Dendrocalamus strictus.—It was suggested in the previous plan that an area of about five acres will be annually planted with the rhizomes of *Dendrocalamus strictus*. This was carried out for sometime and as the results achieved were not encouraging, was given up. Hence the introduction of this species is not prescribed.

390. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) Control book (Bamboo exploitation).
(*b*) Record of works (Bamboo areas).
(*c*) Control journal.

(*a*) *Control book.*—This will contain a record of all bamboo areas exploited in each range annually and periodically with prices obtained.

(*b*) *Record of works.*—All operations carried out in connection with the artificial propagation of bamboo in this division will be entered in this register classified under the following heads :—

(i) These prescribed in the Working Plan.
(ii) These recommended or suggested in the Working Plan.
(iii) Those neither prescribed nor suggested but carried out.

(*c*) *Control Journal* (*Bamboo*).—This will contain observations made by the District Forest Officer in the field as to the adequacy or otherwise of the working plan prescriptions, the advisability of introducing bamboo in other localities in the division with reasons the ruling prices of bamboo at various markets and the costs of extraction from various bamboo areas. Short notes on the various species attempted to be raised with comments on the degree of success obtained in relation to the costs.

SECTION 2.—VALLIYUR RESERVE.

391. *Manure leaf.*—Small areas of not more than five acres may be planted in all the ranges in suitable localities with *Poincianna elata Thespacea popalloxea* and *Cassia siamea* species and those areas worked on a five-year rotation. If this system proves successful, suitable areas in Aviapere beat of Kuttalam Reserved Forest, Kadayanallur beat in Kadayanallur Reserved Forest, Karuppaswami Koil beat in Vasudevanallur Reserved Forest, Pudupatti and Kannur beats in Srivilliputtur Reserved Forests, Koriar and Sivasailam beats of Papanasam Reserved Forest may be taken up for planting with the sanction and approval of the Territorial Conservator. The Agency of exploitation will be decided by the District Forest Officer with the previous approval of the Conservator. Annual areas for plantation will be selected by the District Forest Officer.

SECTION 3.—CASUARINA.

392. Casuarina plantations over small areas were raised in this division from 1942 to 1945 experimentally. The following table shows the particulars of the existing plantations with the years of their formation and exploitation ;—

Name of Rangs. (1)	*Locality.* (2)	*Extent.* (3) ACS.	*Year of formation.* (4)	*Year of exploitation.* (5)
Kuttalam	Ayiraiperi	1	1944	1954
		4	1945	1955
		2¼	1946	1956
Ambasamudram	Mundanthorai ..	5	1943	1953
		10	1944	1954
		10	1945	1955
	Sivasailem	4½	1945	1955
Nanguneri	Teri reaerve ..	8	1943	1953
		10	1944	1954
	(Kachanavalai) ..	5½	1945	1955
	Valliyur reservs ..	4	1941	1951
		20	1942	1952
		35	1943	1953

From 1945 onwards the attempt for raising such plantations was given up, due to the scarcity of water in many localities and the abonormal cost of production of such plantations The water table was so low in certain localities that the plants began to die as soon as watering was discontinued after the second year. In certain localities, death was attributed to the unsuitability of the soil.

The following prescriptions will be followed :—

(i) As it is observed that many trees are dying in some of the plantations, they should not be allowed to rot in the areas or stolen. Every year, dead casuarina trees will be marked in all the plantations and sold in public auction. Trees sold will be uprooted.

(ii) The markings will be done in January or February of each year, because some of the trees which appear to be dead may sprout during the rainy season.

(iii) It is not proposed to replant the exploited areas with casuarina ; but the District Forest Officer will use his discretion and decide the nature of regeneration to be undertaken for reclothing such areas paying heed to the nature of the soil, etc.

SECTION 4.—SOFTWOOD.

393. *Previous history.*—During 1947, 112 trees in Kodamady beat (on the Southern bank of Serviar) and 114 trees in Kariar valley were marked by the Department and were leased to a contractor (the Manager of Bharata Matchwood Factory, Kadambur) for match industry. The trees were *spondias mangifera*, *Alstonia* and *Bambax malabaricum*. The felling and conversion was to be carried out by the contractor and he was to pay before removal Re. 0–4–0 per cubic foot on ground log volume measured at stump site. He has so far completed removal of only a portion of the trees marked in Kodamady and has not yet felled the trees narked in Kariar valley. He has stopped further extraction as it is not profitable for the time being. The cost of production exceeds at present the price now being paid by local match factories as shown below :—

	Per cubic foot. RS.	A.	P.
Seiniorage fees	0	4	0
Felling and conversion	0	4	0
Dragging to the road side	0	2	0
Transport from the forest to the rail head over a distance of about 20 miles	1	0	0
Transport charges by rail from Ambasamudram to the match factory ..	0	4	0
	1	14	0

On the reconnaissance report, the Chief Conservator of Forests directed that the possibility of extracting suitable matchwood species from the evergreen forests of Papanasam Reserve be investigated with the proviso that the cost of production should not exceed the price now being paid for by local match factories.

On investigation it was found that the species which are used locally for match industries (*Alstonias cholaris*, *Spondias mangifera*, and *Bombax malabaricum*) are available on a moderate scale in the Serviar and Kariar valleys of Ambasamudram Range. The suitable exploitable size for this industry is considered to be between 5 to 10 feet girth at breast height.

For extraction of trees for this industry, the locality where the trees are marked should be easily accessible by carts or lorries, as unlike the extraction of timber where the logs can be sawn into scantlings, for the match industry they have to be removed in the form of round logs, preferably when they are still fresh.

The rate paid at the match factories is now Rs. 1–8–0 per cubic foot. This is less than the cost of production. It may be unwise to draw any definite conclusions from the working of the very small number of trees sold in 1947.

Hence, it is prescribed that whenever there is demand and where there is possibility of the price obtained from the match factories being higher than the cost of production. The District Forest Officer with the previous approval of the territorial Conservator may mark the species required in the following localities which are easily accessible and have already been worked for timber during the period of the last plan :—

(i) Areas in Kariar valley, beyond the present teak plantations.

(ii) Areas in Serviar valley adjoining Knapp's Hut road and Kuduvarai road.

SECTION 5.—GAME PRESERVATION.

394. The decrease of game in this division is in a large measure due to the prevalence of illicit shooting and the failure to enforce rigidly on the shooting licence-holder, the conditions under which these licencess are issued. The following prescriptions are therefore accordingly made :—

(i) When a shot which cannot be adequately accounted for is heard, when machans or shelters of any kind are seen, when traps of snares are found, the District Forest Officer will take disciplinary action. against the subordinate concerned.

(ii) It will be known that certain licence-holders entrust their guns to others who thus shoot illicitly, whether their principals or present or not. Again in Mundanthorai plateau in Ambasamudram range, the common practice is the shooting of other than carnivorae from motor cars, lorries, machans, etc., with the aid of artificial lights at night as this locality is easily accessible by cars and lorries. This is to be expressly prohibited. Every effort should be made by every one concerned to detect such offenders, and on apprehension, the name of the offender should be posted in a " Black List " maintained for the purpose in the District Forest Office. It is suggested that the whole area lying between Serviar and Thambaraparani and also the whole of Koilteri beat should be closed for shooting for a period of at least 10 years. The District Forest Officer will obtain the sanction of the Government.

(iii) The names of persons convicted of shooting offence in a Court of Law, should be posted on the " Black List " alluded to above, and no individual whose name has been so posted should be given shooting licence for a period of at least three years after the date of conviction. The Territorial Conservator will examine the list during the annual office inspection in order to ensure that it is up-to-date.

(iv) Each beat map should be posted with the approximate position of all saltlicks and water holes in the beat. The Range Officer concerned will inspect all such places half-yearly, preferably during the hot weather and certify to the effect that they are free from machans and hides. The District Forest Officer will check a certain number of beats of each Range in order to satisfy himself of the accuracy of such certificates. It is recommended that the Kalakad, Tiru the Karangudi and Vallanad beats of Nanguneri Range, the Sivasailem and Govindaperi beats of Ambasamudram Range and the beats in Kuttalam and Vasudevanallur reserves of Kuttalam Range be particularly visited in this connection as they are favoured resorts of poachers.

(v) The District Forest Officer will ensure by periodical surprise inspection that ibex and black buck in Vallanad reserve are not subject to poaching. The rule regarding the size of head of these animals which it is permissible to shoot is embodied in the shooting licence and should be rigidly enforced.

SECTION 6.—FIRE PROTECTION.

395. *General.*—In Tirunelveli division most of the reserves are situated in rugged and mountainous country ; for a greater portion of the year strong westerly gales sweep across the ghats and where the south-west monsoon is feeble, a prolonged dry season, accentuates the danger from fire. The protection of the catchment areas of the various streams and rivers on which the extensive irrigation on the plains depends, and the amelioration of the intensity of floods, can only be effected by assisting nature in gradually clothing these areas with tree growth. This can only be accomplished by continued protection from fires.

To this end the following prescriptions will be followed :—

(i) *State and zamindari boundaries.*—A permanent guide line in the form of an ungraded inspection path, 10 feet wide, will be constructed at an approximate distance of 60 feet from the common frontier between Government forest and the Zamindari or State forests in the places mentioned below, at the time of construction all grass roots on the line should be uprooted. Each year in January this guide line will be roughly recleared and at the earliest possible date, that is, as soon as the grass between the line and the frontier is dry enough, it will be burnt.

Serial number.	Name of fire lines.	Length. M.	Length. F.	Width. FEET.
	Srivilliputtur.			
1	Gundamanaikkanur boundary line as marked on 4-inches scale map.	1	0	60
2	Sethur boundary line from Pillar No. 1 to shola above Gali-podimottai.	2	6	60
	Kuttalam.			
3	Thirumalainaikkan pudukudi boundary	3	4	60
4	Boundary between Chokkampatti Zamin and Krishnapuram Reserve.	3	2	60

Serial number.	Name of fire lines.	Length. M.	Length. F.	Width. FEET.
	Kuttalam—cont.			
5	Northern boundary between Vairavankulam Zamindari and Krishnapuram Reserve.	2	4	60
6	Southern boundary between Vairavankulam and Zamin Kadayanallur.	2	4	60
7	Boundary between Vadagarai, Kilpidagai Reserve and Vallakalteri State Reserve.	2	4	60
8	Western boundary of Vadagarai Melpidagai Reserve	3	0	60
9	Western boundary between Kuttalam and Travancore State Forest.			
	Ambasamudram.			
10	Singampatti Zamin boundary in Aladiyur beat	4	4	60
11	Kattaimalai Estate West boundary	2	0	60
	Nanguneri.			
12	Singampatti Zamin boundary from Vandal Odai to Panjanthangimottai.	3	0	60
13	Travancore State boundary from peak above Nadugani to Mahendragiri shola.	1	2	60
14	Boundary between Travancore State Forest and Parivarisurian Reserve.	3	0	60
	Total ..	32	2	

(ii) *Roads and paths.*—The necessity for fire tracing frequented roads and paths in order to prevent damage by fire from the carelessness of way-farers is emphasized. All roads and paths should not be fire-traced as a matter of routine; the District Forest Officer will satisfy himself before he prepares his fire-protection estimate as to whether fire tracing the whole or part of the roads or paths listed below is essential and obtain the prior sanction of the Territorial Conservator for such deviation as may be found necesasry from the prescriptions.

In the case of roads, 10 feet wide, guide lines will be cut on either side beyond the side drains, and all grass shrubby growth cut and piled on the edge of the road ; as soon as the cut material is dry enough, it should be burnt care being taken that no inflammable material is left unconsumed and that the fire does not escape into the forest.

With paths, guide lines 10 feet wide, allowing 6 feet width for the path, will be cleared on either side and the cut material piled on either side of the edge of the path and burnt as above.

It is essential that all operations be conducted under the personal supervision of an officer not below the rank of Forester and that all burning operations are completed before the 15th of February. The following is a list of roads and paths in the various ranges which should be fire-traced.

NOTE.—Only the extent of these roads and paths passing through deciduous forest or grassy areas need be fire-traced.

Serial number.	Road or path.	Length. M.	Length. F.
	Srivilliputtur Range.		
1	Athithondu Puliyuthu path	4	2
2	Virusadi Mudaliaruthu path	1	4
3	Muthaliaruthu Chittar path	6	4
4	Gundamanickkanur bridle path from reserve line to the Travancore frontier.	4	0
	Kuttalam Range.		
5	Shenbagadevi path	4	3
6	Tekkumalai path	2	3
7	Vallam path	1	4
8	Krishnapuram valley path	4	6
9	Kottamalai valley path	3	0
	Ambasamudram Range.		
10	Papanasam Ghat road up to Upper Dam	5	0
11	Kundanthorai-Kodamady road (up to Tharivattamparai)	2	4

Serial number.	Road or path.	Length.	
		M.	F.
	Nanguneri Range.		
12	Sengalteri-Mudalauppan path	3	7
13	Kopparai road	2	4
14	Manpothai-Thirukarankudi path	6	0
15	Nadugani combined path and road	4	0
	Total ..	56	1

(iii) *Interior fire lines.*—The maintenance of the following important interior fire lines with the object of protecting catchment areas. Sandal forest, etc., is prescribed. Two guide lines, 10 feet wide will be cut on either side of a central belt, 30 feet wide. The cut material will be heaped on the centre of the line and burnt before the 15th of February.

Serial number.	Fire line.	Length.	
		M.	F.
	Srivilliputtur Range.		
1	Virusadi Chockampatti line	2	0
2	Muriapanchanmottai to cairn No. 182	4	4
3	Muriapanchanmottai to Kavaranemottai	2	0
4	Kavaranemottai to Anaikaravarammottai	4	6
	Nanguneri Range.		
5	Panchanthangimottai-Karamandiamman Shola ridge	4	2
	Total ..	17	4

(iv) *Fire patrols.*—Fire patrols will be continued to be employed to assist the local subordinate staff in extinguishing fires and apprehending incendiaries. The localities and the period of their employment will be naturally vary from year to year according to intensity and distribution of the annual rainfall. It is prescribed therefore that they will be employed for the minimum period annually consistent with the adequate protection of the reserves from the risk of fires at the discretion of the District Forest Officer.

(v) *Fire fighting.*—As soon as a fire is noticed no matter what the time, the forest guard and watcher will collect labour through village officials and contractor's coolies from the nearest village and proceed to the spot and extinguishing it by beating it out with branches or throwing earth, or counterfiring if necessary. An investigation into the cause of every fire should be made in every case and if it is due to incendiarism no pains should be spared to detect and convict the offender. It is recommended that forest subordinates who have detected such offender and secured their conviction in a Court of Law be given a monetary reward as an encouragement. The amount of such reward will be decided by the territorial Conservator.

396. *Expenditure.*—The costs of clearing and burning external fire-lines is shared on a 50 per cent basis with the respective state and zamin administrations concerned.

The annual estimate for fire protection for each range will be submitted on the 1st of April, the close of the fire season for all practical purposes and will be accompanied by a map of the range on a scale of 1 inch to 1 mile showing the disposition of all external and internal fire-lines burnt and roads proposed to be fire-traced. In addition the area for which each fire-patrol is employed will be indicated. The District Forest Officer before sanctioning the estimates will review the effectiveness or otherwise of the measures adopted in the previous year, and the extent to which the internal and external fire-lines burnt and the fire-patrols engaged, have been effective in keeping out the fires or reducing the areas burnt. Each year's estimate will summarise the results of the past year's operations and state the number of fires and the aggregate area burnt in each range for that year, the influence of climate factors such as excessive drought, etc., being suitably commented upon.

397. *Control.*—The following control records will be maintained by the District Forest Officer :—

(*a*) *Fire control journal.*—A bound note-book will be maintained which will contain complete information on the following points :—

(i) Areas closed to grazing annually on account of fire.

(ii) Name and length of fire-lines burnt with costs.

(iii) The incidence of fire on each range in the form of a tabular statement showing :—

(*a*) Total area of range, (*b*) date of fires, (*c*) area burnt, (*d*) probable cause of fire and (*e*) percentage of area burnt to area protected.

(iv) Observation of the District Forest Officer. Adequacy or insufficiency of the fire-protection measure prescribed with reasons.

(*b*) *Fire maps.*—These will be on a scale of 1 inch to 1 mile for each range ; every fire will be marked to scale on the maps, serial numbers being given to them in chronological order. One set of fire maps will be used for five successive years, fires of each year being distinguished. The correct maintenance of these maps shall be pointed for special scrutiny by the territorial Conservator during his inspection of the District Forest office.

SECTION 7.—ROADS AND BRIDGES.

398. *General.*—All roads and bridges whether used or not must be kept in a state of repair by the maintenance of good system of drainage which is invariably an economy. The annual repairs to metalled and fair weather roads should aid not only at a progressive improvement of the surface but also at a gradual extension of the width ; all blind corners and bends should be gradually widened. The existing roads and paths in this division are divided into two classes :—

(*a*) those requiring annual repairs, and

(*b*) those requiring occasional repairs.

399. *Annual repairs.*—The following roads and bridlepaths will be annually repaired throughout their length. Repairs to unmetalled roads will consist in filling in ruts, repairing damaged culverts and retaining walls, rectifying defective drainage and clearing growths on either sides. Repairs to bridlepaths will be restricted to the maintenance of an adequate drainage system and the repair of broken down revetment walls and land-slips. It will also include the clearing of growth on either side of the road to a width of not less than 3 feet.

Serial number.	Road or path.	Length. M.	Length. F.
	Srivilliputtur Range.		
1	Athithondu Puliyuthu bridlepath	4	2
2	Virusadi-Thalamalaiyankoil path	6	2
3	Virusadi-Mudaliaruthu path	1	4
	Kuttalam Range.		
4	Shenbagadevi path	2	1
5	Thekkumalai path	2	3
6	Kottanteri road	3	3
7	Puckle's path	3	4
	Ambasamudram Range.		
8	Kannikatti-Kalivelipil path	3	4
9	Mulagajam-Taravittanparai	2	5
10	Kannikatti- Martin's Hut	6	3
11	Pechiammankoil-Kuduvarai road	5	7
12	Mundanthorai-Kodamadi road	6	0
13	Kodamadi-Knapp's Hut	7	5
14	Knapp's Hut-Wood's Hut	2	3
15	Wood's Hut-Cox's Hut	10	0
16	Cox's Hut-Kuduvarai	7	0
17	Kariar-Kannikatti new diversion road	7	3
18	Old Kannikatti road	6	0
19	Puckle's path	1	4
	Nanguneri Range.		
20	Sivanaperi-Mudalaruppan road	4	5
21	Mudalaruppan-Sengalteri	3	7
22	Sengalteri-Nettrikal road	6	6
23	Kalakad-Sivaneperi road	1	0
24	Kopparai cart-track	3	4
25	Nadugani cart-track	5	5
26	Netterikal-Tirukurangudi path	7	0
27	Approach road to Nazareth rest-house	0	7
	Total ..	122	7

400. *Occasional repairs.*—All other existing roads and bridlepaths enumerated will be maintained in a state of repair by the respective beat subordinates. All that is necessary is to keep the drainage system clear, remove obstructions and repair damaged culverts and retaining walls where necessary. In case, damage such as land-slips, etc., occurs to any of these communications and consequent repairs cannot be undertaken by the subordinate unaided, the District Forest Officer, subject to a report being made to the territorial Conservator, will sanction the requisite expenditure necessary. A sum of Rs. 500 will be allotted annually for such unforeseen repairs.

401. *New construction.*—The existing bridle path from 10-2 of Kodamadi road to Wood's Hut may be converted into a road in the event of taking up extraction of soft-wood species and the cardamom lessees coming forward to meet a portion of the cost of construction. This will really open the evergreen sholas and make the cardamom areas easily accessible. A trace has already been aligned in 1946 by the Forest Engineering branch.

SECTION 8.—BUILDINGS.

402. All buildings will be kept in a state of repair. The surroundings of all rest-houses, inspection sheds and subordinates quarters shall be kept clear of undergrowth to a radius of 100 feet around the buildings as an anti-malarial measure, in addition, it is prescribed that every building situated within the reserve be adequately protected against fire by clearing a 12-foot wide strip around its compound, of all undergrowth, and burning the cut material early in February. The burnt strip should be kept clear of inflammable material by the local beat subordinates.

Sanitary arrangements in the rest-houses of the division are not satisfactory. The Public Works Department in Tirunelveli have of late been introducing septic tanks manufactured by the Hume Pipe Company in their inspection bungalows at a cost of about Rs. 250 inclusive of commode or squatting slab and pipes, where there is no pipe-line for water the commodes are flushed by pouring down a bucket of water. This arrangement will be introduced for all the rest-houses in the division.

403. *Water-supply.*—The existing wells will continue to be maintained and cleaned annually.

SECTION 9.—BOUNDARIES.

404. *State boundaries.*—The common boundary between Travancore State and Government reserve is not required to be either inspected or cleared.

405. *Other reserve boundaries.*—The common boundaries between the revenue survey limits on the plains and the reserved forests shall be kept free of all growth to a width of at least 15 feet by the respective beat subordinates. All the cairn stones should be white-washed and numbered with tar annually. All changes in the boundary from year to year will be marked in the record copy maintained in the District Forest office as soon as they have been sanctioned by competent authority.

SECTION 10.—RAINGAUGES.

406. *Rain-gauges.*—All gauge readings shall be measured by an officer not below the rank of Forester. The Range Officer will submit a certificate to the District Forest Officer annually that all foresters authorized by him to measure rainfall are thoroughly conversant with the method of reading and recording both single bottle and differential rain-gauges Rain-gauge readings will be takn at intervals of a week during the monsoon, i.e., May to July and October to January and monthly intervals during dry weather. Monthly statements of all rain-gauges in their jurisdiction with dates of readings, will be submitted to the District Forest Officer by all Range Officers so as to reach the former by the 15th of the succeeding month.

SECTION 11.—REGISTER OF DEVIATIONS.

407. A register of deviations from the prescriptions of the working plan shall be maintained in the following form :—

Year.	*Working Circle.*	*Prescription.*	*Natuse of deviation.*	*Reasons for deviations.*	*Remarks on any possible action to remedy the deviation.*	*Number and date of order sanctioning deviation.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)

CHAPTER X—ESTABLISHMENT AND LABOUR.

SECTION 1.—ESTABLISHMENT.

408. *Executive staff.*—If it is decided that the afforestation of Teri reserve is to be taken up on a large scale, it is prescribed that the Government be addressed for the sanction of a new range to be formed with Srivaikuntam as its headquarters.

The statement below shows the range establishment :—

Designation.	*Name of range.*				
	Srivilliputtur.	*Kuttalam.*	*Ambasamudram.*	*Nanguneri.*	*Total.*
Range Officers	1	1	1	1	4
Foresters	2	2	3	3	10
Forest guards	10	13	11	17	51
Reserve watchers	10	13	11	17	51
Bungalow watchers	..	1	1	..	2
Range clerks	1	1	1	2	5
Peons	1	1	1	1	4

409. *Forest guards' beats.*—The following table shows the distribution of forest guards beats as it exists now. The beat boundaries have been marked as the 4 inches scale maps as accompanying the plan, each beat having been allotted a serial number. The District Forest Officer, however, will be permitted for adequate reasons, and with the previous approval of the territorial Conservator, to increase the number of beats or alter their boundaries as laid down in the working plan maps. It is prescribed that each beat guard be provided with a plan of his beat on a scale of 4 inches to 1 mile and the Range Officer concerned will be that the guard is able to read the map correctly and locate the boundaries concerned.

Serial number and name of beat.	*Headquarters.*	*Approximate distance of outer boundary.* M.	F.	*Remarks.*
	Srivilliputtur Range.			
1 Khansapuram	Khansapuram	11	0	....
2 Pudupatti	Pudupatti	8	0	Government quarters.
3 Kunnur	Kunnur	5	4	....
4 Rangarthirtham	Srivilliputtur	6	4	....
5 Rangarkoil	Do.	6	0	....
6 Alagarkoil	Athithondu	2	4	Government quarters.
7 Valaikulam	Do.	11	0	Do.
8 Athithondu	Do.	7	0	Do.
9 Aiyanarkoil	Mudangiar	6	4	Do.
10 Rajamparai	Do.	7	0	Do.
	Kuttalam Range.			
11 Vasudevanallur	Naranapuram	2	2	Government quarters.
12 Naranapuram	Do.	7	4	Do.
13 Karuppaswamikoil	Chellapuli	4	0	Do.
14 Puliangudi	Melapuliangudi	4	4	Do.
15 Chintamany	Do.	7	4	Do.
16 Krishnapuram	Kumandapuram	3	4	....
17 Kadayanallur	Kadayanallur	3	6	....
18 Chinnakadu	Kasidarman	3	4	....
19 Pampuli	Pampuli	5	0	....
20 Vallam	Vallam	2	0	....
21 Kuttalam	Kuttalam	3	0	Government quarters.
22 Aiyarperi	Do.	3	4	Do.
23 Mathalamparai	Mathalamparai	2	4	....
	Ambasamudram Range.			
24 Kadayam	Mettur	4	0	....
25 Govindaperi	Govindaperi	4	0	....
26 Sivasailem	Sivasailem	5	0	Government quarters.
27 Ambur	Do.	5	0	Do.
28 Koriar	Papanasam	3	4	Do.
29 Aladiyur	Do.	8	4	Do.
30 Koilteri	Mundanthorai	Nil.		Do.
31 Pudarmalai	Do.	Nil.		Do.
32 Kodamadi	Kodamadi	Nil.		Do.
33 Kariar	Upper Dam	Nil.		....
34 Kannikatti	Kannikatti	Nil.		Government quarters.

Serial number and name of beat.	*Headquarters.*	*Approximate distanee of outer bouudaries.*		*Remarks.*
	Nanguneri Range.			
		M.	F.	
35 Kolundumamalai	Sheranmahadevi	16	0	....
36 Terkuviranallur	Pudukudi	4	4	....
37 Padmaneri	Padmaneri	6	4	Government quarters.
38 Vadagarai	Sivanaperi	5	4	Do.
39 Sengalteri	Koovapatti	Nil.		Do.
40 Kalakad	Sivanaperi	3	6	Do.
41 Malayadipudur	Do.	6	4	Do.
42 Nambikoil	Namiar site	4	6	Do.
43 Tirukkarangudi	Do.	3	2	Do.
44 Valliyur	Tirukkarangudi	5	6	....
45 Parivarisuriyan	Do.	4	6	....
46 Vallanad	Vallanad	9	6	....
47 Manakarai	Manakarai	9	6	....
48 Kachinavilai	Kachinavilai	5	6	....
49 Nazareth	Nazareth	6	4	....
50 Kanam	Kanam	5	4	....
51 Kayamali	Kayamali	7	4	....

NOTE.—Beat numbers 46 to 51 will come under Srivaikuntam Range if it is formed.

It is proposed to employ two forest guards on special duty for plantation work at Nazareth which will make the total number of forest guards 53.

It is suggested that the hill beat guards and reserve watchers be recruited from among the Kanis if suitable men are available, and if plainsmen are posted to such beats they should be given a shift within a period of not more than 18 months.

410. *Headquarters staff.*—The staff at headquarters will consist of—

District Forest Officer	1
Head Clerk and Accountant	2
Draughtsman	1
Clerks	6
Typist	1
Peons	4

SECTION 2.—LABOUR.

411. The present supply of unskilled labour is sufficient for the works proposed in the working plan. On the hills in Ambasamudram Range, the Kanis should be preferred to plainsmen for all unskilled work as they are cheaper and if properly treated, more dependable than plainsmen.

The raising of teak plantations in the regeneration working circle in Ambasamudram Range with the aid of Kani ponamdars is of the utmost importance, and the District Forest Officer should make every effort to secure their goodwill and co-operation both by giving them all reasonable concessions and by ensuring that they are not oppressed by subordinates.

CHAPTER XI—FINANCIAL FORECAST AND COST OF THE WORKING PLAN.

SECTION 1.—REVENUE.

412. *Timber.*—The evergreen working circle having been decided to be given rest, no revenue is anticipated under this head during the period of the plan. It has, however, been prescribed that softwood trees for match industry sold as and when demand airses. A lump sum provision of Rs. 7,500 is provided on the basis of an average annual exploitation of about 2,000 cubic feet at an average price of 4 annas per cubic foot for a period of 15 years during the period of the plan under miscellaneous prescriptions.

413. *Fuel and small timber.*—The revenue under this head will be from :—

(i) Timber-cum Fuel Working Circle,

(ii) Fuel Working Circle, and

(iii) Regeneration Working Circle.

The estimates of revenue under (i) and (ii) have been based on the average revenue per acre for the last 8 years from 1940–41.

Serial number.	*Name of felling series.*	*Working Plan estimate.*	*Total area to be exploited from 1949–50 to 1963–64.*	*Tatal revenue.*
	(i) *Timber-cum-Fuel Working Circle.*			
		RS.		RS.
1	Ayyanarkoil	450	2,166	9,74,700
2	Puliangudi	300	1,048	3,14,400
3	Kuttalam	400	462	1,74,800
4	Padaramalai	250	1,558	3,89,500
5	Koilteri	400	1,065	4,26,000
6	Kalakad	240	1,340	3,21,600
	Total ..		7,639	26,01,000
	(ii) *Fuel Working Circle.*			
1	Unnipathi	160	842	1,34,720
2	Pudupatti	175	1,545	2,70,375
3	Rangarkoil	70	1,321	92,470
4	Alagarkoil	210	1,234	2,89,140
5	Valaikulam	50	709	35,450
6	Vasudevanallur	250	1,830	4,57,500
7	Karuppaswamikoil	275	1,772	4,87,300
8	Kadayanallur	240	1,444	3,46,560
9	Chinnakadu	140	941	1,31,740
10	Mathalamparai	230	1,111	2,55,530
11	Govindaperi	100	851	85,100
12	Sivasailam	250	1,610	4,02,500
13	Ambur	80	903	72,240
14	Koraiyar	150	893	1,33,950
15	Kolundumamalai	40	750	30,000
16	Padmaneri	100	947	94,700
17	Vadagarai	200	1,188	2,37,600
18	Malayandipudur	140	554	77,560
19	Nambikoil	210	868	1,82,280
20	Tirukkarangudi	200	771	1,54,200
21	Parivarisurian	100	987	98,700
22	Vallanad	30	1,884	56,520
	Total ..		24,955	41,26,135
	(iii) *Regeneration Working Circle.*			
1	Kuttalam series	500	225	1,12,500
2	Ambasamudram series	300	150	45,000
	Total ..		375	1,57,500
3	Revenue from thinned teak poles in both the series (lumpsum)	3,000 per annum.		45,000

414. *Sandal.*—The average yield is estimated to 6 tons per annum. At an estimated rate of Rs. 1,500 per ton the annual revenue under this head will be Rs. 9,000. The total revenue therefore will be Rs. 9,000 × 15 or 1,35,000.

415. *Grazing.*—The revenue under grazing is estimated to average Rs. 7,500 per annum. No fee is levied for issue of penning licences. The total will be therefore be Rs. 1,12,500.

416. *Minor forest produce.*—The average annual revenue under this item is estimated to be Rs. 20,000 including the sale of manure leaves, usufructs of palmyra and rent on cardamom leaves. The total revenue therefore will be Rs. 20,000 × 15 or 3,00,000.

417. *Bamboos.*—The revenue from this source is estimated to average Rs. 4,000 per annum which makes the total revenue as Rs. 60,000 for the period of the plan.

418. *Miscellaneous.*—This is a fluctuating item. The average is estimated to be Rs. 20,000. The sources included under this head are compounding fees, fees for extension of voidahs of coupes, sale amounts of tools and other confiscated produce, fines and forfeitures, shooting licence fees, rents on buildings and land leases and permits sold to contractors. The estimate is based on the actuals of 1947-48 allowing a margin. The total revenue for the period of the plan will be Rs. 3,00,000.

Section 2.—Expenditure.

419. *Exploitation.*—The expenditure on exploitation are under the following heads :—

(*a*) Demarcation and survey of annual coupes in the timber-cum-fuel, fuel, and regeneration working circles.

(*b*) Sandal extraction.

Under (*a*) an expenditure of Rs. 600 has been provided for and under (*b*) a sum of Rs. 900 at a flat rate of Rs. 150 per ton for extraction, final cleaning transport to Tirupattur including enumeration of dead sandal trees has been provided for.

420. *Regeneration.*—No artificial regeneration to be done departmentally has been prescribed in the timber-cum-fuel and fuel working circle. Under regeneration working circle artificial regeneration of teak is prescribed under kumri method. But in case kumridars are not available, the work may have to be done departmentally. Hence a provision of Rs. 50 per acre is made which includes the cost of tending for two years. The total expenditure will therefore be Rs. 1,250 per annum. For thinning a lump sum of Rs. 500 per annum is provided. It is proposed to afforest Teri reserved forest with pot plants of Prosopis, cashew and lebbek at 200 acres per year. The annual expenditure under this item is estimated to be Rs. 25 per acre including the nursery cost or Rs. 5,000.

421. *Fire protection.*—The expenditure under fire protection is estimated to be Rs. 1,500 per annum.

422. *Roads and bridges.*—The annual maintenance of the existing roads is estimated to be Rs. 4,000 including those for which occasional repairs are needed. Construction of new road is contemplated during the period of the plan.

423. *Building.*—The annual maintenance of all existing buildings in the division is estimated to be Rs. 2,000 per annum based on past actuals.

It has been proposed to reopen old Srivaikuntam Range. If this proposal is approved by Government rented buildings for the office accommodation will have to be provided for. A capital expenditure of Rs. 3,000 is provisionally made for the construction of a Range Office which does not include cost of site. A sum of Rs. 25 per mensem or Rs. 300 per annum is provided for the purpose of paying rent for the office till one is constructed.

A lump sum provision of Rs. 100 per annum is provided for cleaning wells in the division.

424. *Stores, tools and plants.*—An ordinary expenditure of Rs. 250 per annum is provided for under this head.

425. *Establishment.*—The statement below gives the data on which the average annual expenditure under establishment are based :—

	RS.
(1) Pay of the District Forest Officer (Assistant Conservator of Forests) on average rate of Rs. 500 per mensem.	60,000
(2) Head clerk and Accountant on Rs. 95 each per mensem	2,280
(3) Six clerks and one Draughtsman at Rs. 60 each per mensem ..	5,040
(4) One typist on Rs. 55 per mensem	660
(5) Four peons on Rs. 20 per mensem	960
(6) One sweeper on Rs. 10 per mensem	120
Total ..	69,060

	RS.	RS.
(1) Five Rangers at Rs. 100 per mensem	500	6,000
(2) Five Range clerks at Rs. 45 per mensem	225	2,700
(3) Eleven foresters at Rs. 50 per mensem	500	6,600
(4) Fifty-three guards at Rs. 25 per mensem	1,325	15,900
(5) Five peons at Rs. 16 per mensem	80	960
(6) Fifty-one watchers at Rs. 13 per mensem	663	7,956
(7) Two bungalow watchers at Rs. 13-8-0 per mensem	27	324
Total ..		40,440

The total expenditure under this head amounts Rs. 1,09,500.

The following allowances will be required annually for the staff :—

	RS.
(1) Travelling allowance at Rs. 800 per mensem	9,600
(2) Fixed Travelling allowance at Rs. 13–2–0 × 11 or Rs. 144–6–0 per mensem (Voted Rs. 1,732–8–0) or 1,750.	1,750
(3) Conveyance allowance for five rangers at Rs. 22–8–0 × 5 Rs. 112–8–0 per mensem.	1,350
(4) Other compensatory allowance for one forest guard at Rs. 4–1–0 per mensem Rs. 48–12–0 or 50.	50
Total ..	12,750

426. *Miscellaneous.*—Expenditure on supplies and services, service postage, tour charges and office expenses is expected to be Rs. 2,400 per annum based on the actuals for the past five years.

The annual cost of the Conservator and his establishment is expected to be Rs. 60,000. As there are six divisions in this circle, the cost to be debited to this division amounts Rs. 10,000.

SECTION 3.—SUMMARY OF REVENUE AND EXPENDITURE.

427. The statement below gives complete details of the estimated revenue and expenditure during the period of the plan :—

Financial forecast for the 15-*year period from* 1949–50 *to* 1963–64 *in Tirunelveli Forest Division.*

Revenue.			*Expenditure.*		
Serial number and particulars.	*Rate.*	*Amount.*	*Serial number and particulars.*	*Rate.*	*Amount.*
	RS.	RS.		RS.	RS.
1. Timber-*cum*-Fuel Working Circle— Revenue by the sale of 7,636 acres in the 6 felling series.	340	26,01,000	1. Survey and demarcation of 90 coupes including cost of coupe stones.	20	1,800
2. Fuel Working Circle— Revenue realized by the sale of 24,955 acres in the 22 felling series.	165	41,26,135	2. Survey and demarcation of 330 coupes including cost of coupe stones.	20	6,600
3. Regeneration Working Circle— (*a*) Revenue realized by the sale of 375 acres in the two series.	420	..	3. (1) Survey and demarcation of 30 coupes in both the series including subsequent clearings.	20	600
(*b*) Revenue to be realized by the sale of teak poles removed by thinning in the plantations.	3,000 per annum.	45,000	2. Thinning and cleaning.	500 per annum.	7,500 *
			3. Tentative provision for departmental planting.	50 per annum.	18,750 *
4. Sandal Working Circle— Revenue by sale of 90 tons of sandalwood.	1,500 per ton.	1,35,000	4. (1) For the extraction of 90 tons of final cleaned sandalwood.	150 per ton.	13,500 *
			(2) Tending on a 3 year cycle for the 15-year period over a total area of 5,695 acres.	3 annas.	6,277 *
		..	(3) Tending on a 3-year cycle over a total area of 2,708 acres for the 15 year period in the sandal area in the Kuttalam Reserved Forest.	3 annas.	2,538
5. Grazing Working Circle— Revenue by the sale of grazing permits.	7,500 per annum.	1,12,500			
6. Minor Forest Produce Working Circle— Sale of minor forest produce including usufructs of palmyras, cardamom, lease, kists, etc.	20,000 per annum.	30,00,000			
7. Afforestation Working Circle—			7. (1) Planting of palmyra nuts in 100 acres per annum or 1,500 acres for the period of the plan.	3 per acre.	4,500
			(2) Planting of Prosopia cashew and labbek over 200 acres per annum or 3,000 acres for the period of the plan.	25 per acre.	75,000

* The rate includes cost of rough cleaning and travport to Tirupputtur depot and also enumeration of dead sandal trees.

Revenue.

Serial number and particulars.	*Rate.*	*Amount.*
	RS.	RS.
8. Miscellaneous prescriptions—		
(*a*) Sale of bamboos ..	4,000 per annum.	60,000
(*b*) Sale of soft wood for 10 years out of 15 years.	500 per annum.	5,000
(*c*) Miscellaneous other sources.	20,000 per annum.	3,00,000

Expenditure.

Serial number and particulars.	*Rate.*	*Amount.*
	RS.	RS.
8. (1) Planting bamboo rhizomes over 5 acres per annum or 75 acres.	10 per acre.	750
(2) Fire protection ..	1,500 per annum.	22,500
(3) Maintenance of roads and bridges.	4,000 per annum.	60,000
(4) (*a*) Maintenance of buildings.	2,000	30,000
(*b*) Rent for Srivaikuntam Range Office.	300 per annum.	4,500
(*c*) Maintenance of wells.	100 per annum.	1,500
(5) Miscellaneous, such as stores, tools and plants.	250 per annum.	3,750
(6) Establishment (*vide* details above).	..	18,650
Direction charges		1,50,000
(7) Miscellaneous, such as service postage, tour charges, etc.	2,400 per annum.	36,000

ABSTRACT.

428. The statement below shows the abstract of revenue and expenditure under the various years :—

Revenue. *Serial number and particulars.*	*Amount.*	*Expenditure.* *Serial number and particulars.*	*Amount.*
	RS.		RS.
1 Fuel and small timber	69,29,635	1 Exploitation	57,565
2 Sandal	1,35,000	2 Regeneration	80,250
3 Bamboos	60,000	3 Fire protection	22,500
4 Grazing	1,12,500	4 Roads and bridges	60,000
5 Minor forest produce	3,00,000	5 Buildings and wells	36,000
6 Miscellaneous	3,05,000	6 Miscellaneous	3,750
		7 Establishment and contingencies ..	10,18,650
			3,600
		8. Directions	15,000
Grand Total ..	78,42,135	Grand Total	14,64,715

	RS.
Anticipated surplus of revenue over expenditure during the 15 year period.	56,77,420
Annual anticipated profit	4,45,161
	PER CENT.
Gross revenue per acre	30·2
Management cost per acre	5·7
Surplus per acre	24·3
Percentage of expenditure of revenue	18·9

429. *Surplus.*—The annual surplus is expected to average Rs. 4,45,161 as against the average surplus of Rs. 5,82,539 for the decennium ending 1946–47. The decrease of Rs. 1,37,378 is due to the abnormal increase of prices during the war years from 1941–42 to 1945–46. The estimates of revenue being based on current prices are conservative. No comparative statement is attached as we cannot depend upon these figures which were highly inflated due to conditions arising out of war.

SECTION 4.—COST OF THE WORKING PLAN.

430. The division was formed on the 12th June 1947 and was closed on October 1948. The details of expenditure under various heads are noted below :—

	RS.
Pay of Officers (Voted)	10,972
Pay of establishment	5,267
Travelling allowance (Voted)	5,961
Dearness allowances	3,375
House-rent allowances	285
Other compensatory allowances	47
Fixed travelling allowances	309
Contingencies	1,453
Working Plans (Cost of experiment)	2,010
Total ..	29,679

The expenditure works out to 2 annas per acre of forest.

CHAPTER XII.—*Summary of Prescriptions.*

	PARA.	PAGE.
1. *Area and distribution.*—The Working Plan covers an area of 2,60,445·56 acres or 406·95 square miles divided for administrative purposes into four ranges, namely:—	24	4

	ACRES.
Srivilliputtur	45,793·21
Kuttalam	51,588·08
Ambasamudram	83,210·41
Nanguneri	79,853·86

	PARA.	PAGE.
2. The object of management are briefly.— (i) to regulate the supply of fuel small timber and agricultural implements with reference to the requirements of villages and towns in the vicinity of the forest. (ii) to obtain revenue from the extraction of dead sandal trees. (iii) to obtain revenue from minor forest produce. (iv) to supply the pastoral needs of the population. (v) to afforest Kudiraimozi teri reserve. (vi) to maintain the forests in an increasing state of productivity by natural regeneration, by converting suitable areas clothed with a comparatively unremunerative tope of growth into teak plantations and of sandal growth in sandal areas. (vii) and to protest the forest from fire.	230	81
3. *Working Circle.*—The areas of the working circles are as shown below :— (1) The Timber-*cum* Fuel Working Circle 21,540 acres .. .. (2) The Fuel Working Circle 45,410 acres .. .. (3) The Regeneration Working Circle 1,214 acres .. .. .. (4) The Sandal Working Circle 4,742 acres .. .. (5) The Minor Forest Produce Working Circle—The whole working plan area. (6) The Grazing Working Circle 126, 751 acres .. .. .. (7) The Afforestation Working Circle .. 11, 371 acres	235	82
4. The period of the plan will be 15 years from 1st April 1949 to 31st March 1964. The field work for revision will be taken up 2 years earlier to the date of the expiry of the period.	236	83
5. *The Timber-cum-Fuel Working Circle* consists of all accessible deciduous forest capable of growing small timber on a rotation of 40 years:—		
(i) The Working Circle is divided into six felling series	240	83
(ii) The sivicultural system will be simple coppice system	242	83
(iii) The rotation will be 40 years	243	83
(iv) The yield will be regulated by area	244	83
(v) The annual coupe will be surveyed and demarcated in accordance with the felling series map by cut lines 10 feet wide by Range Officer. District Forest Officer to check 25 per cent of the surveys. Each coupe to be divided into not less than two strips.	245	83–84
(iv) Extraction to be done through the agency of contractors ..	247	84
(vii) Reserved species	249	84
(viii) Disposal of arrear areas.	250	84
(ix) Felling to proceed strip by strip felling rules given. All small timber to be hammer marked by the beat guard before removal who will maintain an account Range Officer to send monthly abstract of these accounts to the District Forest Officer.	252	84
(x) Four salient corners of each coupe will be demarcated by cut stone slabs showing the year of working and coupe number.	255	85
(xi) All coupes will be closed to grazing for a period of ten years including the year of felling.	256	85
(xii) All fire burnt areas will be closed to grazing immediately after the occurrence of fire.	257	85
(xiii) The contractors will supply the agricultural implements to the public on demand at the prices fixed by the District Forest Officer. This condition to find a place in the sale notice and in the agreement.	258	85
(xiv) Charcoal burning will be permitted not more than two pits in any one acre.	259	86
(xv) The contractor to be responsible for the illicit fellings which occur within 10 chains of the boundary leased out.	260	86
(xvi) Record of yield to be maintained	261	86

		PARA.	PAGE
6.	*The Fuel Working Circle.*—This consists of all accessible deciduous forests capable of growing fuel on a 30-year rotation.		
	(i) The working circle has been divided into 22 felling series ..	266	87
	(ii) The silvicultural system will be the simple coppice system ..	268	87
	(iii) The rotation will be 30 years	269	87
	(iv) The yield will be regulated by area	270	87
	(v) The annual coupe will be surveyed and demarcated in accordace with the felling series map by cut lines 10 feet wide by Range Officer. The District Forest Officer to check 25 per cent of surveys.	271	87
	(vi) Each coupe to be divided into not less than 2 strips by cut lines 6 feet wide.	272	88
	(vii) Extraction to be done through the agency of contractors ..	273	88
	(viii) Disposal of arrear areas	274	88
	(ix) Reserve species	275	88
	(x) Felling to proceed strip by strip	275	88
	(xi) The contractor to stack all wood cut before removal. Small timber and posts to be hammer marked at stump site before removal by a competent forest officer.	276	88
	(xii) Four salient corners of the annual coupe to be demarcated with cut stone slabs showing the coupe number, the year of working as well as the adjacent coupe number and its year of working.	278	91
	(xiii) All felled coupes of five years inclusive of the year of felling to be closed to grazing. Closed areas to be distinguished on the ground by clearly painting the coupe stones with a red band 3 inches wide running across the centre of the stone horizontally and maintained with fresh paint till the coupe is thrown open.	279	91
	(xiv) Big fire burnt areas to be immediately closed after the fire. (for grazing).	280	91
	(xv) The contractor to supply agricultural implements and small timber to the ryots at the rates fixed by the District Forest Officer and this condition to be embodied in the lease agreement. The District Forest Officer to verify this whenever possible by making enquiries in the neighbouring villages.	281	91
	(xvi) The contractor to sell fuel in retail in the coupe under working to the public at the rates fixed by District Forest Officer.	282	91
	(xvii) Charcoal burning to be permitted by the District Forest Officer at his discretion in approved sites.	283	91
	(xviii) Record of yield	284	91
7.	*Regeneration Working Circle.*—This consists of semi-deciduous forests suitable for conversion into teak plantations and also of all existing plantations.	286	92
	(i) Two felling series are formed	288	92
	(ii) All plantations to be of regular shape and the boundaries maintained by periodical clearing.	290	92
	(iii) The silvicultural system will be clear felling and stump planting with teak.	292	92
	(iv) The area to be selected by the District Forest Officer for the annual planting.	296	93
	(v) The annual coupe to be sold in November and the contractor to fell and remove produces burn unsaleable material and hand over the area in a state fit for planting by the 15th of April.	297	93
	(vi) The area will be stump planted with teak at an espacement of 6 feet by 6 feet early in May.	302	94
	(vii) Casualties to be replaced in the first year	305	94
	(viii) Planting to be done by ponamdars	306	94
	(ix) Nursery work	308	94
	(x) Weeding to commence immediately after completion of planting and be conducted progressively to the end of October. Casualties to be replaced simultaneously. Work to be done by ponamdars	316	95

	PARA.	PAGE
(xi) No weeding normally necessary in the third year. Pruning to be done if necessary during the third year.	316	95
(xii) Cleaning to be done in the fifth year	318	95–96
(xiii) Thinnings in accordance with the tabular statement attached	319	96
(xiv) All plantations to be closed to grazing	322	97
(xv) Departmental plantations should be undertaken in case ponamdars are not available.	325	97
8. *Afforestation Working Circle.*—Covers the whole of the Kudiraimozhi Itteri reserve.	327	98
(i) It is divided into 8 blocks	328	98
(ii) Planting pot plants of Prosopis to be carried out during 1948. If the experiment proves successful Prosopis planting will be taken up over an area of 200 acres, 100 acres near Nazareth Rest House and 100 acres in Semmarikulam block annually.	331	100
(iii) Instructions are given for raising the pot plants in the nursery and for planting them out.	331	100
(iv) 100 acres in Teri Reserved Forest to be planted up with palmyra every year.	332	101
(v) The Palmyra leases will be 5 years	336	
(vi) The conditions of palmyra leases are given	337	101–102
9. *Sandalwood Working Circle.*—This comprises the whole of the sandal bearing areas in this division.	339	102
(i) Only one felling series is constituted	340	102
(ii) Extraction will be limited to dead trees and will be conducted in accordance with the revised sandalwood felling rules. The yield will be regulated by area.	346	103
(iii) The felling cycle will be 3 years	349	104
(iv) Regular extraction will be done in the Alagarkoil sandal felling series. Periodical extraction on a 3-year cycle will be done in the Kuttalam Sandal Felling series.	349	104
Occasional extraction involving the extraction of all dead trees wherever noticed in the other sandal areas will be done.	349	104
(v) Extractions will be done departmentally	351	104
(vi) All final cleaned wood will be sent to Tiruppattur sale depot for sale.	353	104
(vii) The tending cycle will be 3 years. Tending rules are prescribed.	356	105
(viii) Propagation centres will be established beats of the division. Name of beats and localities given.	359	105–106
(ix) The whole of the working circle with the exception of regeneration areas to be opened to grazing.	361	107
(x) Attempts will be made by the District Forest Officer to induce pattadars to sell their dead sandal trees to us for extraction, the rate of payment being decided by the territorial Conservator.	361	107
10. *Grazing Working Circle.*—The grazing working circle includes all the accessible deciduous forests where grass is available, with the exception of areas closed for silvicultural reasons or reserved as bison sanctuaries.	364	108
(i) The range will be the unit of grazing for control purposes ..	368	108–109
(ii) Grazing will be regulated by issue of permits at uniform rates for the whole division.	370	109
(iii) The grazing year will be from 1st July to the succeeding 30th June.	371	109
(iv) Penning to be permitted free of cost and under restrictions ..	372	109
11. *Minor Forest Produce Working Circle.*—This includes the whole division.	379	111
(i) The produce to be sold in 35 lease units	380	111
(ii) The collection of minor forest produce will be by contract agency; but departmental extraction is provided for under certain contingencies.	381	112
(iii) Stump planting of tamarind along road margins suggested ..	384	112
(iv) Dammar to be collected by the contractor's coolies by ignitian method.	385	113

	PARA.	PAGE
12. *Miscellaneous Regulations—*		
(i) *Bamboo working—* (a) The felling cycle will be 3 years .. .. (b) Working will be by contract agency .. .. (c) Felling rules are given .. .. (d) When gregarious flowerings are observed the whole area will be sold in auction felling restrictions being removed. (e) Any of the small bamboo areas mentioned in paragraph may be put up for auction by the District Forest Officer if he is satisfied that they are exploitable and demand exists. The felling cycle will be 5 years.	388	113–114
(ii) *Bamboo regeneration—* (a) *Bambusa arundinacea* will be stump planted on an area of 5 acres on the Aladiyur plateau annually at an espacement of 33 feet by 33 feet in April and May. The Provincial Silviculturist to be addressed for the supply of rhizomes. (b) Rhizomes to be planted on the banks of Servaiyar, Pechiyar and Nambikoil Ar.	389	114–115
(iii) *Casuarina plantations* exist over the whole division over small areas. Prescriptions are laid down for working these plantations. Dead trees are to be marked annual and uprooted.	392	115–116
(iv) *Softwood.* Previous history of extraction of this species given. To be extracted whenever there is demand and where there is possibility of the cost of production being less than the prices paid at match factories. The District Forest Officer with the approval of the territorial Conservator to mark the species.	393	116
(v) *Preservation of game.* Prescriptions for enforcing the conditions of shooting licences are given.	394	117
(vi) Fire protection. The common boundary between Government forests and State or Zamin forests will be fire traced annually in January to a width of 60 feet.	395	117–120
(vii) All frequented paths and roads will be fire traced annually by 15th February. The District Forest Officer is given discretion to modify prescription with the approval of territorial Conservator.	395	117–120
(viii) Interior fire lines for the protection of catchment areas or sandal areas are prescribed.	395	117–120
(ix) Fire patrols will continue to be employed for the minimum period necessary.	395	117–120
(x) Fire fighting measures are prescribed	395	117–120
(xi) List of roads requiring annual maintenance	399	120
(xii) All other roads and paths to be maintained by subordinates ordinarily.	400	121
(xiii) The possibility of converting the bridle paths from Knap's Hut to Wood's Hut into a cart-track to be investigated.	401	121
(xiv) All buildings to be kept in a state of repair	402	121
(xv) Introduction of septic tanks with flush latrines suggested ..	402	121
(xvi) The revenue survey boundary to be kept clear of all growth to a width of 15 feet by the respective beat subordinates.	405	121
(xvii) A register of deviations should be maintained in the forms given.	407	121
13. *Establishment and labour.*—(i) The formation of Srivaikuntam Range is suggested in case if the afforestation of Teri reserve is to be taken up on a large scale.	408	122
(ii) The number of beats to remain as 51 and the number of special duty guards to be appointed 2. The District Forest Officer will be permitted with the previous approval of the territorial Conservator to increase the number of beats or alter their boundaries as laid down in the working plan map.	409	122–123
(iii) Each beat guard should be supplied with a plan of his beat on a scale of 4 inches to a mile.	409	122–123

APPENDIX I.

Botanical list of trees with times of flowering and seedling.

Botanical name.	*Tamil name.*	*Time of flowering.*	*Time of fruiting.*
Abrus precatorius	Kundumani	....	....
Acacia conciana	Sheyakkai	....	....
Acacia ferruginea	Sennei velvel or Karambai.	....	May.
Acacia latronum	Karodai or Kakaodai.	....	February.
Acacia leicophloea	Velvel	January	April-June.
Acacia pennata	Vellai Indu	....	....
Acacia planifrons	Odai	February	April-June.
Acacia sundra	Karungali	....	....
Acrocarpus fraxinifolius	Malankonnai	February	April-May.
Adina cordifolia	Manjakadambei	November	....
Aegle marmelos	Vilam	....	....
Aglaia courtallensis	Vegula chokla	....	....
Aglais minutiflora	Piramuttipala	....	....
Aglaia roburghiana	Chokla	April-May	January.
Agrostistachys longifolia	Manikulukki	....	....
Agrostistachys meeboldii	....	....	....
Ailanthus excelsa	Peemaram	March	....
Ailanthus malabarica	Mattipal	....	....
Alangium lamarckii	Allinji	....	May.
Alangium salvifolium	....	....	....
Albizzia amara	Usil	July	December-January.
Albizzia lebbek	Vagai or Pannai vagai.	January	March-April.
Albizzia odoratissima	Chithala	May	December-January.
Albizzia procera	Velvagai	....	Do.
Albizzia stipulata	Nirusil	....	....
Alphonsea zeylanica	....	February-April	October-December.
Alstonia scholaris	Fzhilaipalai	....	....
Amoora canarana	Kara agil	....	....
Anacardium occidentale	Munthirikottai	....	....
Abacolosa densiflora	Kalmanikkam	....	....
Anogeissus latifolia	Vekkali	....	July-August.
Anogeissus pendula	Neman	....	....
Anthocephalus cadamba	Kola auila	....	....
Antiaris toxicaria	Naravuri	....	July-August.
Aporosa acuminata	Nirvetti	....	....
Arenga wightii	Alumpanei	....	....
Artocarpus hirsuta	Aiyini pila	....	September-October.
Atlantia monophylla	Malanarathei	....	....
Artocarpus intergrifolia	Pila	....	....
Azadirachta indica	Vembu	March	August.
Baccaurea courtellensis	Thenthi	....	....
Balanocarpus utilis	Karunkongu	March-May	October-November.
Balsamodendron berryi	Kulkiluvai	....	....
Bambosa arundainacea	Moongil	....	....
Bassia longifolia	Katillupai	....	October.
Bauhinia malabarica	Vellathi	....	....
Bauhinia racemosa	Athi	....	....
Bauhinia tomentosa	....	....	....
Bentinckia coddapanna	Kanthapanei	....	....
Bischofia javanica	Milachadayan	February-March	February-March.
Bombax malabaricum	Muliluvai	....	May-July.
Borassus flabelliformis	Panei	....	....
Bridelia retura	Adamaruthu	....	January.
Buchanania latifolia	Madama or kattuma.	....	May.
Butea frondosa	Porasu	March	....
Cadaba trifoliata	....	....	May.
Cacaalpinna sappan	Sappan	May	....
Calamus rotang	Porambu	....	....
Calophyllum elatum	Pinnei	....	....
Calophyllum inophyllum	Punnamkottai	....	....
Calophyllum trapezifolium	Cherupennai	August	December-January.
Canarium strictum	Karumkunthikam	March	....
Capparis horrida	....	....	....
Carallia integerrima	Andimirian	....	....
Careya arborea	Ayma	May	....
Carissa carandas	Kelakai	....	....
Caryota urens	Koondapanei	....	....
Cassia auriculata	Avaram	....	....
Cassia fistula	Konnai	March-April	April-May.
Cassia siamea	Manjakonnei	....	December-January.
Cedrela toona	Santhana vembu	January-February	April-July.
Celtis wightii	....	....	....
Chlorxyloa swietenia	Vaimara	May-June	May-June.
Churasia tabularis	Madagiri vembu	October	February-May.
Cinnamomum gracile	....	....	....
Cinnamomum zeylanicum	Lavangam	....	....
Clausena indica	....	....	....
Clausena willdenowii	Kattuveppilai	....	....
Clerodendron infortusatum	....	August	....
Cochlosperumum gosaypium	Tanaku	....	....
Combretum ovalifolium	Odankodi	....	....
Cordia myxa	Virusham	....	July-August.
Cratoeva religiosa	Mavalingam	....	....
Croton malabaricus	Thavattupulavu	....	....
Cullenia excelsa	Vedipila	May	October.
Dalbergia latifolia	Thothagathy	April-May	February-March.
Dalbergia multiflora	Viruvatte	February	June.
Dalbergia paniculata	Adukkuvagoi or Pachein.	....	....
Dichrostachys cinerea	Vadathalai	November	....

Botanical name.	*Tamil name.*	*Time of flowering.*	*Time of fruiting.*
Dillenia pentagyna	Nai Teku	....	....
Diospyros assimilis	Karunthalu	....	....
Diospyros bourdilloni	Karumthovarai	....	....
Diospyros embryopteris	Panichi	....	....
Diospyros foliolosa	Vellaithovarai	....	....
Diospyros insignia	Do.	....	....
Diospyros microphylla	Chinnathovarai	....	....
Diospyros montana	Vakkanai	....	....
Diospyros orixensis	Vellei thovarai	....	....
Dipterocarpus bourdilloni	Karanjili	....	....
Dodonea viscosa	Virali	....	....
Dolichandrone crispa	Pumpadiri	....	June-July.
Dysoxylom malabaricum	Vellagil	February-March	....
Dysoxylom beddomei	Chinnagil	....	....
Fhretia loevis	Nariveli	....	....
Floecarpus oblangus	Athankottei	....	....
Floecarpus serratus	Olankarei	April	July.
Floecarpus tuberculatus	Tuthrachem	Do.	....
Flocodendron giaucum	Karai	....	December-May.
Friodendron asfractusum	Ilavam	....	....
Frythrina indica	Mullamurukku	....	March-May.
Frythorixylon monogynum	Shenmanathi	June	December.
Fugenia gardneri	Nirnaval	....	....
Fugenia jambolana	Naval	June	August-September.
Fugenia loeta	....	....	....
Fugenia munronil	....	March-April	November-December.
Fugenia zeylanica	....	May	....
Fubhorbia tirucalli	Tirukalli	....	....
Fvodia roxburghiana	Kattuchampakam	....	....
Feronia elephantum	Vilamaram	....	....
Ficus asperrima	Iramparathan	....	....
Ficus bengalensis	Ala	....	....
Ficus religiosa	Arasu	....	....
Filicuim decipicus	Athuadali	January-February	April.
Flacourtia sepiaria	....	....	Do.
Garcinia cambogia	Kodukapulli	....	....
Garcinia echinocarpa	....	....	....
Garcinia morella	Kakki	....	....
Givotia rottleriformia	....	....	....
Gluta travancorica	Senkurinji	January-April	May-June.
Glycosmis lentaphylla	Kulapanei	....	....
Gmelia arborea	Kumil	....	September-October.
Gmelina asiatica	Kumil	....	....
Gordonia obtusa	....	May	....
Grewia asiatica	....	....	August.
Grewia hirsuta	Kallunnu	....	....
Grewia loevigata	Unnu	August	September-December.
Grewia leptopetala	Do.	....	....
Gyrocarpus jacquini	Thanaku	....	....
Hardwickia binata	Acha	....	....
Hardwickia pinnata	Kolavu	....	December-January.
Hardwickia wightiana	....	....	....
Harpullia cupanioides	....	....	July.
Helicteres isora	Valamburi	March	....
Hemicyclia vensusta	Vellelembu	....	....
Hemigyrosa deficiens	....	....	....
Heritiera papilio	Sadanangu	....	July.
Hippocratea indica	Morusarakodi	....	June.
Holorrhena antidysepterica	Kodagapala	....	....
Holigarna arnottiana	Kattacherei	....	....
Holoptelea integrifolia	Ayili	....	....
Hopea parviflora	Kongu	March-May	July-August.
Hydnocarpus alpina	Maravetti	....	Do.
Hugonia mustax	....	December	August.
Ixora parviflora	....	....	....
Lagerstroemia lanceolata	Ven Teku	....	....
Lansium anamalayanum	....	....	....
Lantana sp.	Arippu	....	....
Laportea crenulata	Anachoriyan	....	....
Leea sambucina	....	....	....
Lepisanthus tetraphylla	....	....	May-November.
Litsoea zeylanica	Shembagapalai	....	....
Lophopetalum wightianum	....	....	....
Maba byxifolia	Irambali	....	....
Macaranga roxburghii	Vettakanni	....	....
Machilus macarantha	Kolamavu	....	....
Mallotus philippinensis	Thavattai	....	September-October.
Mangifera indica	Man	April	July-August.
Mappia foetida	Arali	....	....
Meliosma arnottiana	Kusavi	....	....
Memecylon grace	....	May	....
Mesua ferrea	Sirunangu	June	November-December.
	Peria nangu	July	Do.
Michelia champaca	Champakam	....	....
Miliusa rexburghiana	....	August	....
Mimusops elenji	Mahilamaram	....	....
Mimusops hexandra	Olakapalei	March	....
Mitrephra heyneana	....	June	....
Morinda citrifolia	Manjanathi	May	....
Morinda tinctoria	Do.	....	....
Moringa pterygosperma	Muringa	....	....
Mundulea suberosa	Pullavaram	July	....
Murraya exotica	Kattukaruvepilai	May	....

Botanical name.	*Tamil name.*	*Time of flowering.*	*Time of fruiting.*
Myristica beddomei	Kattujathikai	....	....
Myristica magnifica	....	....	....
Myristica malabarica	....	March	September.
Nephelium longana	Kattupavan or Shenpuvan.	....	May-October.
Niebuhria linearis	....	August	....
Nothopegia colebrookiana	Sorapalai	....	....
Ochlandra brandisii	Eeta	....	....
Ochlandra travancorica	Eeta	....	....
Odina wodier	Kaka usil	March	....
Ormosia travancorica	Maleimanjadi	Do,	April-June.
Palanquium ellipticum	Palvadinjan	....	....
Pandanus tectorius	Talai	....	....
Pavetta indica	Pavetta	....	....
Phoenix farinifera	Eacham	....	....
Phoenix sylvestris	Do.	....	....
Phyllanthus emblica	Nelli	....	April-October.
Pinanga dicksonii	Kana kamuku	....	....
Plectronia didyma	Irambarathan	....	....
Podocarpus latifolia	Neerambuli	....	February-March.
Poeciloneiren indicum	Puthangali	....	....
Poeciloneuron pauciflorum	Do.	March-June	November-December.
Polyalthia cersoides	Nedunar	May	December-January.
Polyalthia lengifolia	Nettilingam	....	....
Polyalthia frangrans	Nedunar	....	....
Pongamia glabra	Pungam	....	....
Premna tomentosa	Kolakkatteri tekku	....	....
Prosopis specigera	Parambai	....	....
Protium caudatum	Pachakuluvai	May	....
Pterocarpus marsupium	Vengai	July-August	March-April.
Pterolobium indicum	Kar indu	....	....
Pterospermum glabresens	Vattapolavu	....	....
Pterospermum rubiginosum	Chithalai polavu	....	....
Pggeum withtianum	Attankari kongu	January	October-November.
Randia dumetorum	Karai	....	....
Sansevieria zeylanica	Marul	....	....
Santalum album	Santhanam	April-August	May and October.
Sapindus emarginatus	Neikottai	....	....
Schleichera trijuga	Poovan	....	....
Semecarpus anacardium	Shera kottai	....	February-May.
Spondias mangifera	Ambalam	....	....
Stephegyne parvifolia	Nir Kadambai	July	....
Sterculia guttata	....	....	....
Sterculia urens	Senthanaku	March	....
Stercospermum chelonoides	Poompathiri	....	....
Streblus asper	Pira	....	....
Strobilanthes sp.	Kurinja	....	....
Strychnos nuxvomica	Etti	....	....
Strychnos potatorum	Thettankottai	....	....
Tamarindus indica	Puli	September-October	April-May.
Tectona grandis	Tekku	July-October	January-April.
Terminalia arjuna	Kolamaruthu	....	....
Terminalia belerica	Tani	July	....
Terminalia chebula	Kadukkai	July-August	January-March.
Terminalia paniculata	Karimaruthu	December	April-May.
Terminalia travancorensis	Pei kadukai	....	....
Trema orientalis	Anparuthi	....	....
Vateria indica	Velleikunthrikam	March-April	September.
Ventilago madraspatana	Vembadam	....	March.
Vernonia arborea	....	....	February.
Vernonia monosis	Suthi	....	....
Vitex altissima	Mylai	May-October	October-December.
Wrightia tinctoria	Thanthapalei	February-March	July-August.
Xanthophyllum flavescens	Narathei	....	....
Zanthoxylum rhetsa	Kattu murukku	....	....
Zizyphus glabrata	Karikotte	....	....
Zizyphus jujuba	Elandai	....	....
Zizyphus oenoplia	Kottei	....	....
Zizyphus trinerva	Karukatan	....	....
Zizyphus xylopyrus	Kotteri	....	....

APPENDIX II.

STATEMENT OF PRICES PER ACRE OBTAINED FOR TIMBER-*cum*-FUEL COUPES FROM 1934 TO 1946.

Serial number and name of felling series. (1)	1934 (2)	1935 (3)	1936 (4)	1937 (5)	1938 (6)	1939 (7)	1940 (8)	1941 (9)	1942 (10)	1943 (11)	1944 (12)	1945 (13)	1946 (14)	*Average.* (15) RS.	A.	P.
1 Ayyanarkoil ..	80	60	76	60	91	65	43	141	186	591	601	551	650	245	12	0
2 Puliangudi ..	23	31	31	48	71	68½	56	99	106	260	331¼	270	431	140	7	0
3 Kuttalam ..	32	109	75	54	130	107	85	109	175	220	500	600 } 420 }	500	200	7	0
4 Koilteri	50	56	100	76	71	35	40	68	74	75	271	626	650 } 250 }	153	4	0
5 Padarmalai ..	22	31	42	23	37	49	66	92 } 90 }	112	250	120	365	211 } 126 }	105	13	0
6 Kalakad	62	48¼	31¾	47	40	56½	45	92	84	185	353¼	313¾	400 } 251 }	129	9	0

NOTE.—Figures in brackets denote sale amount of two coupes in the same year.

APPENDIX III.

STATEMENT OF PRICES PER ACRE OBTAINED FOR FUEL COUPES FROM 1934 TO 1946.

Serial number and name of felling series. (1)	1934 (2)	1935 (3)	1936 (4)	1937 (5)	1938 (6)	1939 (7)	1940 (8)	1941 (9)	1942 (10)	1943 (11)	1944 (12)	1945 (13)	1946 (14)	*Average.* (15) RS.	A.	P.
1 Unnipathimalai.	17	20¼	11½	12	24¼	14½	12	49	40	155	180	150	360	80	7	0
2 Pudupatty ..	11	12¼	12	10½	24	10	9	32	81	150	100	202	205	66	1	0
3 Rengarkoil ..	8	6¼	59/16	9	6	3 1/8	4	16	49	90	115	97	53	35	9	0
4 Alagarkoil ..	40	25½	21	21½	34¾	13 1/8	8	40	51	170	200	352	415	107	2	0
5 Valaikulam ..	18	22	20	16½	25	17¼	13	30	46	65	111	90	67	41	10	0
6 Vasudevanallur.	35	20	30	40	38	90	46	87	100	200	167	272	503	125	4	0
7 Karuppaswami-koil.	15	30	20	50	40	25½	40	106	80	210	241	350	330	118	4	0
8 Kadayanallur ..	17	26	14	41	25	40½	26	56	75	140	215	331	426½	110	3	0
9 Chinnakadu ..	31	50	71	69	51½	35½	50	52	75	150	165	185	151	87	6	0
10 Mathalamparai.	15	22	30	20	24½	25½	30	31	40	125	200	550	315	109	15	0
11 Govindaperi ..	7¼	8	20	11	29	32	26	26	50	55	65	102	91	40	3	0
12 Sivasailam ..	7½	8½	30	8	32	50	65	68	100	196	303	262½	570 } 200 }	115	12	0
13 Ambur	4¼	5	11½	3	31	8½	30	17½	23	45	62	100	120	33	2	0
14 Koriar	54	42½	72½	42	63	49½	90	53	42	50 } 150 }	151	132	280 } 140 } 97 }	88	7	0
15 Kolundumamalai.	16½	12½	11½	30	16¼	14¼	16	11½	11	18	26¼	70	103	27	7	0
16 Padmaneri	30½	24	21½	23	..	10 } 25 }	14¼	19	20	35	175	106	202 } 191 }	56	14	0
17 Vadagarai ..	70	40	23	19	13¼	11½	22	49	51	110	175	175½	230	76	2	0
18 Malayandipudur.	40	27	56	95	30	38	44	41	60	70	130	126	300	91	1	0
19 Nambikoil ..	53	53	30¼	28	44¼	41¼	62	80	97	160	175	151½	230	98	2	0
20 Tirukurangudi ..	51	56	38	35½	35	29	35	36½	69	100	175	170	371 } 370 }	300/90	2	0
21 Parivarisurian ..	24¼	34	13½	20	22	21	21	37¼	53	80	235	185	275	78	9	0
22 Vallanad ..	13	18½	17	14	14	12¼	14	10⅝	14½	24	20	18	32	17	1	0

NOTE.—Figures in brackets note sale amount of two coupes in the same year.

APPENDIX IV.

LIST OF MAPS ACCOMPANYING THE WORKING PLAN, TIRUNELVELI DIVISION.

Serial number and name of range and reserved forest.	*Number of sheets.*
Srivilliputtur Range.	
1 Srivilliputtur Reserved Forest	1 to 6.
2 Valaikulam and Sappaniparambu	1
Kuttalam Range.	
3 Kuttalam Reserved Forest	1
4 Krishnapuram Reserved Forest	1
5 Vasudevanallur Reserved Forest	1 and 2.
6 Vadagarai Melpidagai	1
7 Kadayanallur Reserved Forest	1
Ambasamudram Range.	
8 Papanasam Reserved Forest	1 to 7.
Nanguneri Range.	
9 Kalakad Reserved Forest	1 to 6.
10 Therku Viravanallur Reserved Forest ..	1
11 Kolundumamalai and Manpothai Reserved Forest.	1
12 Vallanad Reserved Forest	1
13 Kuriramozhi Teri Reserved Forest	1 and 2.
14 Management map—	
Srivilliputtur Range	1
Kuttalam Range	1
Ambasamudram Range	1
Nanguneri Range	1

APPENDIX V.

Regeneration Working Circle.

Record of Works.

Prescriptions of the working plan.				*Operations actually carried out.*						*Remarks.*
Felling series.	*Coupe number.*	*Area in acres.*	*Nature of work.*	*Year of working.*	*Felling series.*	*Coupe number.*	*Area in acres.*	*Nature of work.*	*Costs.*	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) RS.	(11)

A. Measures prescribed.

B. Measures suggested.

C. Measures neither prescribed or suggested but carried out.

APPENDIX VI.

Control Journal for the Timber-*cum*-Fuel and Fuel Working Circle.

A. Growing stock.

1. Notes on the relative fuel or small timber value of various species, and their distribution in the several felling series.

2. Notes on the suitability of the rotation and the Silvicultural System prescribed.

B. Factors influencing the crop.

1. Notes on various forms of damage to the crop under the following heads :—
   (*a*) Climatic.
   (*b*) Animal.
   (*c*) Insect.
   (*d*) Fungus.
   (*e*) Weeds and climbers.

2. Notes on the forest offences and suggestions for preventing or moderating them under following heads :—
   (*a*) Illicit fellings or removals of forest produce.
   (*b*) Illicit grazing.
   (*c*) Illicut hunting and fishing.
   (*d*) Trespass into the reserves or assault of forest subordinates.
   (*e*) Offences under the sandalwood and timber transit rules.
   (*f*) Miscellaneous.

3. Incidence of fires and comments on the necessity for or adequacy of the protection measure prescribed.

C. Exploitation.

1. Notes on the suitability of the present division into felling series with reference to the requirements of local markets and the convenience of contractors.

2. Notes on the various methods of exploitation adopted by contractors with costs per unit, i.e., a ton of 128 stacked cubic feet of fuel or 50 cubic feet of timber.

3. Notes on the reliability and work of individual contractors, and on the labour supply.

4. Statement of outturn realized from the several felling series and comparison with that obtained from indicator areas where any have been cut.

5. Statement of prices realized per acre in each felling series and comments.

6. Reasons why any particular series was not worked in any year.

D. Regeneration.

1. Natural regeneration—Detailed observations (preferable sample plot measurements) on—
   (*a*) the growth of coppice shoots,
   (*b*) the causes of failure of coppice,
   (*c*) the relative coppicing powers of various species,
   (*d*) the influence of season of cutting and methods of coppicing on regrowth, and
   (*e*) the extent of seedling regeneration of important timber and fuel species.

2. Artificial regeneration—Notes on—
   (*a*) the success or failure of regeneration measures prescribed with probable reasons,
   (*b*) the relative success attained with various species attempted to be introduced, especially exotics, and
   (*c*) suggestions for improvement or modification of the techinque of regeneration.

3. Nursery practice—Notes on—
   (*a*) the germinative capacity and plant per cent of seeds of various species,
   (*b*) the pre-treatment of seed with results, and
   (*c*) the time of flowering, seedling and leaf fall of the more important species.

E. Markets.

1. *Demand and supply.*—Notes on the adequacy of the supply of fuel and small timber to the various markets and the suitability of the present division into felling series with reference to local market requirements.

2. Prices of fuel, charcoal and small timber in important markets.

F. Statistical.

Statistics.—Note on the rate of growth of fuel and timber species based on periodical measurements of coppice growth of known age and on ring countings.

G. Summary of revenue and expenditure.

A summary of annual revenue and expenditure in such a form as will facilitate comparison with the financial forecast in the Working Plan—vide Madras Forest Department and Account Code—Section 50 (3).

APPENDIX VII.

Record of Works—Timber-*cum*-Fuel and Fuel Working Circle.

Range ;

Name of felling series :

Prescriptions of the working plan.				*Record of operations carried out.*				
Year.	*Coupe number.*	*Area in acres.*	*Name of work.*	*Year.*	*Coupe number.*	*Work done.*	*Cost.* RS. A. P.	*Remarks.*

APPENDIX VIII.

Control Book for the Timber-*cum*-Fuel and Fuel Working Circle.

Range :

Prescriptions of the working plan.						*Operations carried out.*						*Details of yield.*			
Year.	*Name of felling series.*	*Coupe number.*	*Area in acres.*	*System of felling.*	*Estimated yield in ton per acre.*	*Year.*	*Name of felling series.*	*Coupe number.*	*Surveyed area of coupe.*	*Area of coupe actually worked.*	*Total outturn of coupe.*	*Description of outturn.*	*Average outturn per acre.*	*Revenue realized per acre.*	*Gross revenue realized*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)

APPENDIX IX.

Control Journal for the Regeneration Working Circle.

A. Growing stock.

1. Notes on—
   (*a*) The relative timber value of the various species extracted.
   (*b*) The distribution of various species in the annual coupe.

B. Factors influencing the crop.

1. Notes on various forms of damage classified under the following heads with remedies tried or suggested :—
   (*a*) Climatic.
   (*b*) Animals.
   (*c*) Insects (with entomological names wherever possible).
   (*d*) Fungus (should be identified with the help of the Forest Research Institute, if possible).
   (*e*) Fire.
   (*f*) Man.

C. Exploitation.

1. Notes on the suitability of the present division into felling series.

2. Notes on the adequacy of the output.

3. Notes on the suitability of the method of working prescribed.

4. Notes on contractors and labour supply.

5. Statement by girth classes and by species of the estimated yield and the net yield of timber obtained from each felling series, with comments on the varying losses in conversion.

6. Statement of prices realised for each coupe and comments thereon.

7. Statement showing cost of exploitation under—
   (*a*) felling charges per tree,
   (*b*) conversion charges per unit,
   (*c*) manhandling cost per unit with average distance, and
   (*d*) cost of transport per unit from road head to nearest market with distance in miles.

8. Statement showing the total number of gaps in which charcoal burning was permitted and the total yield of charcoal obtained in tons.

9. Deviations, if any, from working plan prescriptions with detailed justification.

D. Measures of improvement.

1. Results of tending operations prescribed with costs.
2. Suggestions for improvement of communications and export routes.

E. Regeneration.

1. Natural Regeneration—Observations on the extent of natural regeneration of the more valuable species.
2. Artificial Regeneration—Detailed comments on the success or failure with reasons of—
   (*a*) the gap system, and
   (*b*) the clear felling and planting system with suggestions for improvement or modification of technique.
3. Statement showing—
   (*a*) total number of gaps,
   (*b*) the number attempted to be regenerated artificially, and
   (*c*) the number of gaps successfully regenerated.
4. Notes on the relative success obtained with various species by—
   (*a*) dibbling or broadcast sowing of seed,
   (*b*) transplanting of seedlings, and
   (*c*) stump planting with costs per unit area or gap.
5. Notes on the effect of charcoal burning on artificial regeneration in the gaps caused by felling.
6. Observations on the relative success obtained with particular species or mixture of species.
   (*a*) Under varying light conditions, and
   (*b*) at varying elevations.
7. Nursery practice—Observations on—
   (*a*) the relative merits of shola and open nurseries with costs,
   (*b*) the flowering and seedling of the more valuable timber species in various localities in the division, and
   (*c*) the germinative capacity and plant per cent of seed of various species obtained from different localities.
8. Notes on pre-treatment of seed.

F. Markets.

1. Statement of the prevailing market price per cubic foot for each of the more important evergreen timbers.

2. Statement by species showing the number of trees marked, the numbers converted, the net yield and the gross revenue obtained.

3. Comments on the state of the evergreen timber market in general and on fluctuations in prices with probable reasons.

G. Statistical.

1. Observations on the rate of growth of various species based on sample plot measurements.
2. Statement showing the percentage of unsound trees of each species found in each one foot girth class.

H. Summary of Revenue and Expenditure.

A summary of annual revenue and expenditure in such a form as will facilitate comparison with the financial forecast in the Working Plan—*Vide* Madras Forest Department and Account Code, Section 50 (3).

APPENDIX X.

Regeneration Ledger for the Timber-*cum*-Fuel Working Circle.

Name of felling series :
Range :
Year of regeneration:

Name of coupe regenerated :
Area regenerated :

						Results of operations.		
Nature of operations.	*Date of operations.*	*Total Cost.*	*Rate of cooly wage.*	*Species sown with quantity of seed.*	*Species planted with number of seedlings.*	*At the beginning of second growing season, average number of seedlings per chain of line.*	*At the beginning of third growing season, average number of seedlings per chain of line.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX XI.

Regeneration Working Circle.

Control Book.

Prescriptions of the working plan.					*Operations actually carried out.*							
Locality to be exploited.					*Locality exploited.*							
Felling series.	*Coupe number.*	*Area in acres.*	*Nature of felling.*	*Year of working.*	*Felling series.*	*Coupe number.*	*Area in acres.*	*Nature of fellings.*	*Species.*	*Yield in cubic feet.*	*Price per acre.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
											RS.	

APPENDIX XII.

Regeneration Ledger—Regeneration Working Circle.

Name of range :
Locality :
Area :
Cost of demarcation :
Year of plantation :
Price of standing crop :
Date of completion of clear felling :
Date of first burning :

Date of completion of successive burning :

Date of sowing or dibbling other species :
Date of planting :
Espacement :
Total number of stakes :
Number of kanis in settlement :
Rate of daily wages :
Name of Ranger in charge : (Season for each species separately. Percentage of stocking at the beginning of second growing.)
Percentage stocking at the beginning of third growing season.

Year and month.	*Nursery costs.*	*Collection of seed.*	*Preparation of stumps and transport.*	*Lining and stacking.*	*Planting teak stumps including replacements.*	*Planting or sowing other species including replacements.*	*First weeding.*	*Second weeding.*	*Third weeding.*	*Weeding in second year.*	*Second weeding in second year.*	*Cleaning in third year.*	*Other expenses.*	*Monthly total expenditure.*	*Monthly rainfall nearest R.C. Station.*	*Progressive total of annual expenditure.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.		RS.	

APPENDIX XIII.

Control Book for the Reserve Sandal Working Circle.

Range:
Felling Series :

Prescriptions of the working plan.				*Record of operations carried out.*							
Locality to be exploited.				*Locality exploited.*							
Year.	*Number of block.*	*Area in acres.*	*Nature of fellings.*	*Year.*	*Number of block.*	*Area in acres.*	*Nature of fellings.*	*Sub-coupe number.*	*Area in acres.*	*Yield (rough) cleaned. wood.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)

APPENDIX XIV.

Record of Works—Sandal Working Circle.

Range :

Prescriptions of the working plan.				*Record of operations carried out.*				
Year.	*Locality.*	*Area in acres or quantity.*	*Nature of work.*	*Year.*	*Locality.*	*Area in acres or quantity.*	*Nature of work.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX XV.

(*a*) CONTROL JOURNAL FOR THE SANDAL WORKING CIRCLE.

A. Growing stock.

1. Remarks on—
   (*a*) The spread or disappearance of sandal as compared with the stock maps, and
   (*b*) The ecology of sandal.

B. Factors influencing the crop.

1. Notes on the new appearance of spike disease.
2. Incidence of fire in sandal areas annually with observations on the effect of fire on sandal.
3. Observations on the influence of climate and elevation on the sandal growing stock.
4. Remarks on the prevalence of sandal theft ; and destruction of damage to sandal by man or animals.
5. The incidence of grazing in sandal areas and its effect on sandal.
6. The effect of conducting coppice fellings in sandal areas on the sandal growing stotk.

C. Exploitation.

1. Remarks on the suitability or adequacy of exploitation prescribed.
2. Abstract of the number of trees marked in each block in girth classes and proportion of sapwood trees.
3. Abstract of cost of exploitation for each item of work with explanations for annual variations.
4. General remarks on the results of inspection of main depot.
5. Remarks on labour supply.
6. Detailed reasons with authority for deviation from Working Plan prescriptions.

D. Measures of improvement.

1. Remarks on the conduct of tending operations prescribed ; their costs and results.
2. Results of fire protection operations with costs.
3. Suggestions for improvement of communications.

E. Regeneration.

1. Natural regeneration—Observations on the extent of natural regeneration invarious compartments and probable causes of its poverty or abundance in any particular locality.

2. Artificial regeneration—Observations on the success or failure of propagation centres, strip regeneration experiments prescribed. Results of methods of regeneration not prescribed, but carried out, with costs.

3. Nursery practice—Observations on—
   (*a*) The time of flowering and seeding of sandal, whether the species seeds twice a year always ; comparison of the first and second seed-crops,
   (*b*) The relative germinative capacity and plant per cent of seeds from different localities in the division, and
   (*c*) The effect of various methods of pre-treatment of seed.

F. Markets.

1. Sandal prices—Statement of the quantity of each class of sandal marketed with corresponding prices obtained ; statement of gross and nett revenue realised.

2. Retail sale—Statement of total quantity of sandal sold annually at each retail sale depot with comments on the system of sale, mode of advertisement, etc.

G. Statistical.

1. Observations of the rate of growth of sandal based on measurements of trees of known age, or periodical measurements of the same trees, or from ring countings.
2. Statement of dryage, loss in conversion, etc.
3. Outturn averages.

H. Summary of revenue and expenditure.

A summary of annual revenue and expenditure in such a form as will facilitate comparison, with the financial forecast in the Working Plan—Vide Madras Forest Department and Account Code—Section 50 (3).

APPENDIX XVI.

PROPAGATION CENTRE JOURNAL.

Range :

			Propagation centre.					*Date of sowing.*				*Replacement of casualties.*				
Year.	*Name of beat.*	*Locality.*	*Serial number.*	*Size.*	*How formed.*	*Origin of seed.*	*Name of host species.*	*Sandal.*	*Host.*	*Date of first germination of sandal.*	*Date of completion of germination of sandal.*	*Date.*	*Number of seedlings.*	*Survivals at the beginning of May.*	*Survivals at the beginning of May.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)

APPENDIX XVII.

The Grazing Working Circle.

Control Book.

Year.	Range and area.	Localities closed to grazing.	Area in acres.	Penning.	Range and area.	Localities closed to grazing.	Area in acres.	Number and description of cattle grazed.	Revenue realized.	Name of pen.	Number of cattle licensed to pen.	Revenue realized.	Grazing incidence per cow unit.	Remarks.
	Prescriptions of the Working Plan.				*Operations carried out.*									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)

APPENDIX XVIII.

Grazing Working Circle.

Control Journal (Sample headings).

1. Annual abstract of grazing permits issued by villages. The following headings are suggested :—
   (*a*) Year.
   (*b*) Name of range.
   (*c*) Name of village.
   (*d*) Number and description of permits issued.
   (*e*) Number and description of permits issued in previous year.
   (*f*) Reasons for increase or decrease.

2. Notes on the suitability or otherwise of the agency of collection employed.

3. Notes on the suitability or otherwise of the grazing year adopted.

4. Notes on the efficacy of closure of burnt areas (*a*) as a preventive measure, and (*b*) as silvicultural measure.

5. List of areas closed to grazing annually on account of fires with notes on the results of half-yearly inspections.

6. Notes on the efficacy of enhancement of grazing fees in burnt areas, (*a*) as a preventive measure, and (*b*) as a silvicultural measure.

7. Notes on the desirability or otherwise of closure of fuel coupes to grazing.

8. Notes on the necessity for extending or reducing the limits of the grazing working circle in each range.

9. Notes on semi-wild cattle in Vallanad and Kudiramozhi Teri reserves in Nanguneri range with details of methods adopted or suggested to deal with these parts.

10. Notes on the incidence and intensity of cattle diseases in the division.

11. Notes on the bison sanctuaries in Nanguneri range.

12. Notes on the desirability or otherwise of permitting penning.

13. Statement of revenue and expenditure (if any) as laid down in section 50 (*c*) of the Madras Forest Code.

APPENDIX XIX.

Control Book for the Minor Forest Produce Working Circle.

Year.	Name of produce.	Method of working.	Unit of lease.	Period of lease.	Method of working.
	Prescriptions of the Working Plan.				
(1)	(2)	(3)	(4)	(5)	(6)

Unit of lease.	Period of lease.	Yield obtained.	Gross revenue realised.	Expenditure incurred.	Remarks.
Aecord of operations carried out.					
(7)	(8)	(9)	(10)	(11)	(12)

APPENDIX XX.

Record of Works—Minor Forest Produce Working Circle.

Range—

Year.	Locality.	Nature of work.	Locality.	Nature of work.	Cost.	Remarks.
	Prescriptions of the Working Plan.		*Operations carried out.*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)

APPENDIX XXI.

Afforestation Working Circle.

Record of Works.

Year.	Prescriptions of Working Plan.			Year.	Record of operations carried out.				
	Locality.	*Area or quantity.*	*Nature of work.*		*Locality.*	*Area or quantity.*	*Nature of work.*	*Cost of each operation.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		A. Measures prescribed.							
		ACS.							
1949–50.	Semmarikulam Block.	100	Fuel plantations with double line planting of pot plants of prosopis lebbek, Inga dulce cashew, etc., at 12 feet espacement.						
1949–50.	Nazareth Block.	100	Do.						
1949–50.	Teri Block ..	100	Palmyra dibbling at an espacement of 10 feet by 10 feet.						

B. Measures suggested.

C. Measures neither prescribed nor suggested but carried out.

APPENDIX XXII.

Afforestation Working Circle—Control Journal.

(Sample headings.)

A. Growing stock.

1. Notes on the relative fuel and small timber value of various species and their distribution in the several blocks.

2. Notes on the relatives and fixation value of various shrubs, grasses and tree species found on the Teri.

B. Factors influencing the crops.

1. Notes on various forms of damage to the crop under the following sub-heads :—
   (*a*) Climatic,
   (*b*) Animal,
   (*c*) Insect,
   (*d*) Fungus,
   (*e*) Weeds and climbers.

2. Notes on forest offences and suggestions for preventing or moderating them under the following sub-heads:—
   (*a*) Illicit felling or removals of forest produce.
   (*b*) Illicit grazing.
   (*c*) Trespass or assault of forest subordinates.
   (*d*) Miscellaneous offences.

3. Artificial regeneration—Notes on—
   (*a*) The success or failure with probable reasons of—
   (i) the fuel plantations, and
   (ii) the palmyra plantations.
   (*b*) the relative success obtained with various species attempted to be introduced with relative costs, and
   (*c*) The technique of introduction of various species with suggestions for its improvement or modification with reasons.

4. Nursery practice—Notes on—
   (*a*) The germinative capacity and plant per cent of seeds of various species with reference to the locality of collection, age of seed bearers, etc.
   (*b*) The pretreatment of seed with results.

C. Exploitation.

1. Remarks on the suitability or adequacy of the exploitations prescribed.

2. Abstract of enumerations of palmyras in each farm.

D. Measures of improvement.

Suggestions for improvement of communications.

E. Regeneration.

Natural regeneration.—Observations on the extent of natural regeneration in various blocks or compart ments and the probable cause of the poverty or abandance in any particular locality.

F. Markets.

1. Retail and wholesale prices of forest produce such as cashewnuts, screwpine flowers, palmyra leaves and fibre, etc.

2. Principal centres of consumption of such produce.

G. Statistical.

Observations on the rate of growth of palmyrahs and tree species based on periodical measurements of trees of known age or of the same trees.

H. Summary of revenue and expenditure.

A summary of annual revenue and expenditure in such a form as will facilitate comparison with the financial forecast in the working plan—Vide Madras Forest Department and Account Code—Section 50 (3).

APPENDIX XXIII.

Afforestation Working Circle.

Plantation Ledger (Fuel Plantation).

Year :
Locality :
Area :

Year and month.	*Demarcation.*	*Nursery costs.*	*Stacking and aligning.*	*Manuring.*	*Seed collection.*	*Staggered line planting.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Fuel species.			*Replacement of casualties.*	*Other expenses.*	*Monthly rainfall in units Nazareth.*	*Progressive totals.*	*Remarks.*
Souring.	*Dibbling.*	*Planting.*					
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)

APPENDIX XXIV.

Miscellaneous prescriptions.

(a) Control Book.

Prescriptions of the working palns.				*Operations actually carried out.*				*Details of yield.*		
Locality to be exploited.				*Locality exploited.*						
Year.	*Range.*	*Locality.*	*Nature of fellings.*	*Year.*	*Range.*	*Locality.*	*Nature of fellings.*	*Yield.*	*Price obtained.*	*Remark.*

(b) Record of Works (Bamboo areas).

Prescription of the working plan.				*Operations actually carried out.*					
Year.	*Range.*	*Locality.*	*Nature of work.*	*Year.*	*Range.*	*Locality.*	*Nature of work.*	*Cost.*	*Remarks.*

APPENDIX XXV.

Boundaries of Minor Forest Produce Farms, Tirunelveli-*cum*-Ramanathapuram Division.

Srivilliputtur Range.

Athithonda Section—Farm No. I.—North, from R.F. Cairn No. 25 near Sundakoi kanavoi to Kambathu Medu, Kasikathankombu, Muriappanjanmottai, Kuthukalmottai along stream as far as Periamaruthodai, Virusadi to Mudaliyaruthu bungalow and on to Chittar and thence to Valaiyar near Rakkividathi mottai ; east and south, reserve boundary from pillar No. 25 abovesaid as far as Valaiyar near Coupe V of Ayyanarkoil Working Circle ; west, from near Rakkividathi mottai along Valaiyar to reserve boundary.

Mudangiyar Section—Farm No. II.—North, from near Rakkividathi mottai to Panjanthangi mottai and on to Thirunatheri mottai ; east, western boundary of Farm No. I ; south, reserve boundary from Valaiyar to Sattur zamin boundary as far as Thirunatheri mottai.

Pudupatty Section—Farm No. III.—East and north, reserve boundary starting from Sundakoi Kanavoi path, reserved forest pillar No. 25 along the boundary as far as Periyar ; west, Saptur Zamin and Periyar; south, as far as boundary of Farm Nos. I and II.

Nanguneri Range.

Farm No. I.—Includes Kolundumamalai, Manpothai and Thokuviravanallur reserves as far as the taluk boundary.

Farm No. II.—Starting from Cairn No. 1 of Kalakad Reserved Forest, near Kanimarammankovil the boundary runs right up the old fire line along the ridge through points 1853, 2196, 2283, 2622, 2889 and 3278 to Panjanthangimottai thence along the taluk boundary between Ambasamudram and Nanguneri taluk still it reaches the Kalakad Reserved Forest boundary and thence along this boundary in a southerly direction to the starting point.

Farm No. III.—Starting from Cairn No. 1 on Kalakkad Reserved Forest boundary, the line runs towards south along this boundary till it reaches Karungalkajam and thence upwards along Karungalkajam till it meets Manpothai enclosure boundary ; thence along this boundary till it reaches the water-shed which separates Manimuthu Ar from Narakadu and thence along this water-shed through points 5238, 5139 to point 5272 in the Travancore frontier line ; thence along the Travancore frontier boundary in westerly direction till it meets the Singampatti Zamin boundary and thence along the Singampatti frontier till it reaches Panjanthangimottai and thence in a south-easterly direction along Nanduthumottai through points 3278, 2889, 2622, 2283, 2196 and 1853 to the starting point in the reserved forest boundary.

Farm No. IV.—Starting from Karungalkajam stream where it cuts the Kalakad Reserved Forest line, the boundary runs in a southerly direction along Kalakad Reserved Forest boundary till Cairn No. 19 in Jamarai Ar ; thence along the ridge upwards in a westerly direction through points 1432, 1933, 2426, 3180 and 4564 on Manimottai to Travancore frontier ; thence along this frontier line as far as point 5272 near Vanganaicken anicut ; thence it turns towards east along the water-shed through points 5158, 5238 and thence along the same ridge towards north where it touch Manpothai enclosure ; thence along the enclosure boundary till it cuts Karungalkajam and thence along this stream right down to the starting point on the Reserved Forest boundary.

Farm No. V.—All the Reserved Forests lying in south of the line from Cairn No. 19 above Jamarai Ar in Kalakkad-Tirukurangudi forests to Travancore frontier *via* points 1432, 1933, 2426, 3180 and 4564 on Manimottai.

APPENDIX XXVI.

TAMIL LIST.

Vernacular name (Tamil).	Botanical name.
Acha	*Hardwickia binata.*
Adamarathu	*Bridelia retusara.*
Adukkuvagai	*Dalbergia paniculata.*
Aiyinipila	*Artocarpus hirsuta.*
Alampanai	*Arenga wightii.*
Alanji	*Alangium lamarckii.*
Ala	*Ficus bengalensis.*
Ambalam	*Spondias mangifera.*
Anachorian	*Laportea crenulata.*
Andimirian	*Carallia intergerrima.*
Anparuthi	*Trema crientalis.*
Arasu	*Fiscus-religiosa.*
Arali	*Mappia foetida.*
Arippu	*Lantana sp.*
Athankottai	*Eloccarpus oblangus.*
Avaram	*Cassia auriculata.*
Athi	*Bauhinia racemosa.*
Attanarikongu	*Pygeum wightianun.*
Ayili	*Holoptelea-intergrifolia.*
Ayma	*Careya arborea.*
Champakam	*Michelia champaka.*
Cherupinnai	*Calophyllum trapezifolium.*
Chinnagil	*Dysoxylon beddomei.*
Chinnathovarai	*Dispyros microphylla.*
Chittaloi polavu	*Pterospermum rubiginosum.*
Chittaloi vagai	*Albizzia roderatissima.*
Chokala	*Aylaia roxburghiana.*
Eacham	*Phoenix tarinigera.*
Do.	*Phoenix sylvestris.*
Eota	*Ochlandra brandissi.*
Do.	*Ochlandra travancorica.*
Elandai	*Eizyphrus jujuba.*
Etti	*Strychneas nuxvomica.*
Ezilaipalai	*Astonia scholaris.*
Ilavam	*Eriedendron anfractuosum.*
Irambali	*Maba buxifolia.*
Iramparathan	*Siscus asperrima.*
Do.	*Plectronia didyma.*
Kadukkai	*Terminalia chebula.*
Kaka odai	*Acacia latronum.*
Kakausil	*Odina wodier.*
Kalmanikkam	*Anacolosa densiflora.*
Kalunnu	*Grewia hirsuta.*
Kanakamuku	*Pinanga dicksonii.*
Kanthapanai	*Bentinckia coddapanna.*
Karai	*Randia dumetorum.*
Do.	*Plocodendron glaucum.*
Karagil	*Amoora canarana.*
Kara Indu	*Pterolobium indicum.*
Karanjili	*Dipterocarpus bourdillonii.*
Karikotte	*Zizyphus glabrata.*
Karimarathu	*Terminalia paniculata.*
Karodai	*Acacia latromum.*
Karukatan	*Eizyphus trinervia.*
Karumkongu	*Balanocarpus atillis.*
Karun kunthrikam.	*Canarium strictum.*
Karumthovarai	*Diospyros bourdillonii.*
Karungali	*Acacia sundra.*
Karunthali	*Disspyros assimilis.*
Katillepai	*Bassia longifolia.*
Kattuchampakam.	*Evodia roxburghiana.*
Kattucheri	*Holigarna arnottiana.*
Kattu karuveppilai.	*Murraya exotica.*
Kattumurukku	*Zanthozylum rhetsa.*
Kattupuvan	*Nephelium longana.*
Kattu veppilai	*Clausena wildenovii.*
Kelakai	*Carissa carandas.*
Kodukapuli	*Garcinia cambogia.*
Kola aiyila	*Anthocephalus cadamba.*
Kolakkattai Teku.	*Premna tomentesa.*
Kolamaruthu	*Terminalia arjuna.*
Kolam	*Machilus marcantha.*
Kolava	*Hardwickia pinnata.*
Kongu	*Hopea parviflora.*
Konnai	*Cassia fistula.*
Koonthapanai	*Caryota urena.*
Kottai	*Zizyphus ochoplia.*
Do.	*Zizyphus Xylopyrus.*
Kulapanai	*Glycosmis pentaphylla.*
Kumil	*Gmelina arborea.*
Do.	*Gmelina asiatica.*
Kundumani	*Abrus precatoris.*
Kurinja	*Storbilanthes sp.*
Kusavi	*Meliesma arnottiana.*
Lavangam	*Cinnamomum zeylanicum.*
Maa	*Mangifera indica.*
Madagiri Vembu	*Chuckrassia tabularis.*
Madama	*Buchanania latifolia.*

Vernacular name (Tamil).	Botanical name.
Mahilamaram	*Mimuscps elengi.*
Makki	*Garcinia morella.*
Malainarathei	*Atlantia monophylla.*
Malamanjadi	*Ormosia travancorica.*
Malankonnai	*Acrocarpus fraxinifolius.*
Manikulukku	*Agrostistachys longfolia.*
Manja kadambai	*Adina cordifolia.*
Manja konnai	*Cassia siamea.*
Manjanathi	*Morinda citrifolia.*
Do.	*Morinda tinctoria.*
Maravetti	*Hydnocarpus alpina.*
Maravuri	*Antiaris toxicaria.*
Marul	*Sansevieria zeylanica.*
Mattipal	*Ailanthus malabarica.*
Mavalingam	*Cratoeva religiosa.*
Milachadayan	*Bischofia javanica.*
Moongil	*Bamboosa arundinacea.*
Morusarakodi	*Hippocratea indica.*
Mullilavu	*Bom bax malabaricum..*
Mullumurukku	*Erythrina indica.*
Mullikiluvai	*Balsamodendron berryi.*
Munthrikottai	*Anacardium occidentale.*
Muringa	*Moringa pterygosperma.*
Mylal	*Vitex altissima.*
Naiteku	*Dillenia pentagyna.*
Naman	*Angeissus pendula.*
Nangu	*Mesua ferrea.*
Naranabali	*Podocarpus latifolia.*
Narathai	*Kanthophyllum flavescens.*
Nariveli	*Ethretia loevis.*
Naval	*Fugenia jambolana.*
Nedunar	*Polyaltha cerasoides.*
Do.	*Polyaltha fragrans.*
Neikottai	*Sapindus emarginatus.*
Nelli	*Phyllanthus emblica.*
Nettai lingam	*Polyaltha longifolia.*
Nirkadamba	*Stephegyne parvifolia.*
Nirnaval	*Fugenia gardeneri.*
Nirusil	*Albizzia stipulata.*
Nirvetti	*Aporosa acuminata.*
Odai	*Acacia planifrons.*
Odankodi	*Combretum ovalifolium.*
Olakapalai	*Mimusops hexandra.*
Olankarai	*Flococrupus serratus.*
Pachakiluvai	*Protium caudatum.*
Pachale	*Dalbergia paniculata.*
Palvadinjan	*Planquim ellipticum.*
Panei	*Borassus flabelliformis.*
Panichi	*Diespyres embryopteris*
Panni vagai	*Albizzia lebbek.*
Parambai	*Prosopis spicigera.*
Pexambu	*Calamus totang.*
Pavetta	*Pavetta indica.*
Pee maram	*Ailanthus excelsa.*
Pei kadukai	*Terminalia travancorensis.*
Pila	*Artocarpus intergrifolia*
Pinnai	*Calophyllum clatam.*
Pira	*Streblus asper.*
Pira muttipala	*Aglaia minitiflora.*
Ponpathiri	*Streospermum chelonoides.*
Porassu	*Batea frondosa.*
Pull	*Tamarindus indica.*
Pullavaram	*Mundulca suberosa.*
Punpadri	*Delichandrone crispa.*
Pungam	*Pongamia glabra.*
Punnai	*Calophyllum inophyllum*
Puthangali	*Poeciloncuron indicum.*
Puvan	*Schleichera trijuga.*
Ruthrachan	*Floccarpus tuberculatus.*
Sadangu	*Heritera papilio.*
Santhanam	*Santalum album.*
Santhana vembu	*Cedrela toona.*
Sappan	*Coesalpinia Sappan*
Senjurinji	*Gluta travancorica.*
Senthanuku	*Sterculia urens.*
Sheithi	*Veronia monosis.*
Shemanathi	*Erythrexylon monogynum.*
Shempuvan	*Nephelium longana.*
Shenkottai	*Semecarpus anacardium.*
Sherankottai	*Do.*
Sheyakkai	*Acacia concinna.*
Sorapalai	*Notophegia colebrookiana.*
Tani	*Terminalia belerica.*
Thanthapalai	*Wrightia tinctoric.*
Thanaku	*Cochlospermum gossypium.*
Do.	*Gyrocarpus jacquini.*
Tavatee polavu	*Croton malabaricum.*

Vernacular name (Tamil).	*Botanical name.*
Tekku ..	.. *Tectona grandis.*
Tettankottai	.. *Strychnos potatorum.*
Thalai ..	.. *Pandanus tectorius.*
Thonthe ..	.. *Baccaurea courtallensis.*
Thothagathy	.. *Dalbergia latifolia.*
Tirukalli ..	.. *Euphorbia tirucalli.*
Unnu ..	.. *Gerwia loevigata.*
Do. ..	.. *Grewia leptopetala.*
Usil	.. *Albizzia amara.*
Vadathalai	.. *Dichrostachyas cinerca.*
Vaimaram ..	.. *Chloroxylon swictenia.*
Vakkanai ..	.. *Diospyros mentana.*
Valamburi ..	.. *Helictores isora.*
Vattakanni	.. *Macaranga roxburghii.*
Vattapolavu	.. *Pterospermum glabrescens.*
Vedipila ..	.. *Cullenia excelsa.*
Vegula chokla	.. *Agalia courtallensis.*

Vernacular name. (Tamil).	*Botanical name.*
Vekkali ..	.. *Anogeizzus latifolia.*
Vellagil ..	.. *Dysoxylum malabaricum.*
Vellai indu	.. *Acacia pennata.*
Vellaikunthurikam.	*Vateria indica.*
Vellathi ..	.. *Bauhinia malabarica.*
Vellai thovarai	.. *Diospyros foliolosa.*
Do.	.. *Diospyros insignis.*
Do.	.. *Diospyros orixensis.*
Vellelembu	.. *Hemicyclia vensuta.*
Velvel ..	.. *Acacia leucophloca.*
Vembadam	.. *Ventilago madraspatani.*
Vembu ..	.. *Azadirachta indica.*
Vengai ..	.. *Pterocarpus marsupium.*
Vilamaram	.. *Feronia elephantum.*
Vilvam ..	.. *Aegle marmelos.*
Virusham ..	.. *Cordia myxa.*
Viruvettai ..	.. *Dalberiga multiflora.*

Proceedings of the Chief Conservator of Forests

Proceedings Mis. No. 70, 5th February 1953

Working Plan—Tirunelveli Division—Sanctioned.

SRI M. KESAVAN UNNI NAYAR, I.F.S.,
Chief Conservator of Forests.

Proceedings—Mis. No. 70, dated 5th February 1953.

Sanctioned subject to the amendments issued after the preparation of the Working Plan.

M. KESAVAN UNNI NAYAR,
Chief Conservator of Forests.

(True copy)

Personal Assistant.

To the Conservator of Forests, Working Plans Circle.
" Conservator of Forests, Coimbatore Circle.
" District Forest Officer, Tirunelveli.